APRIL 7, 1952

Electrical World

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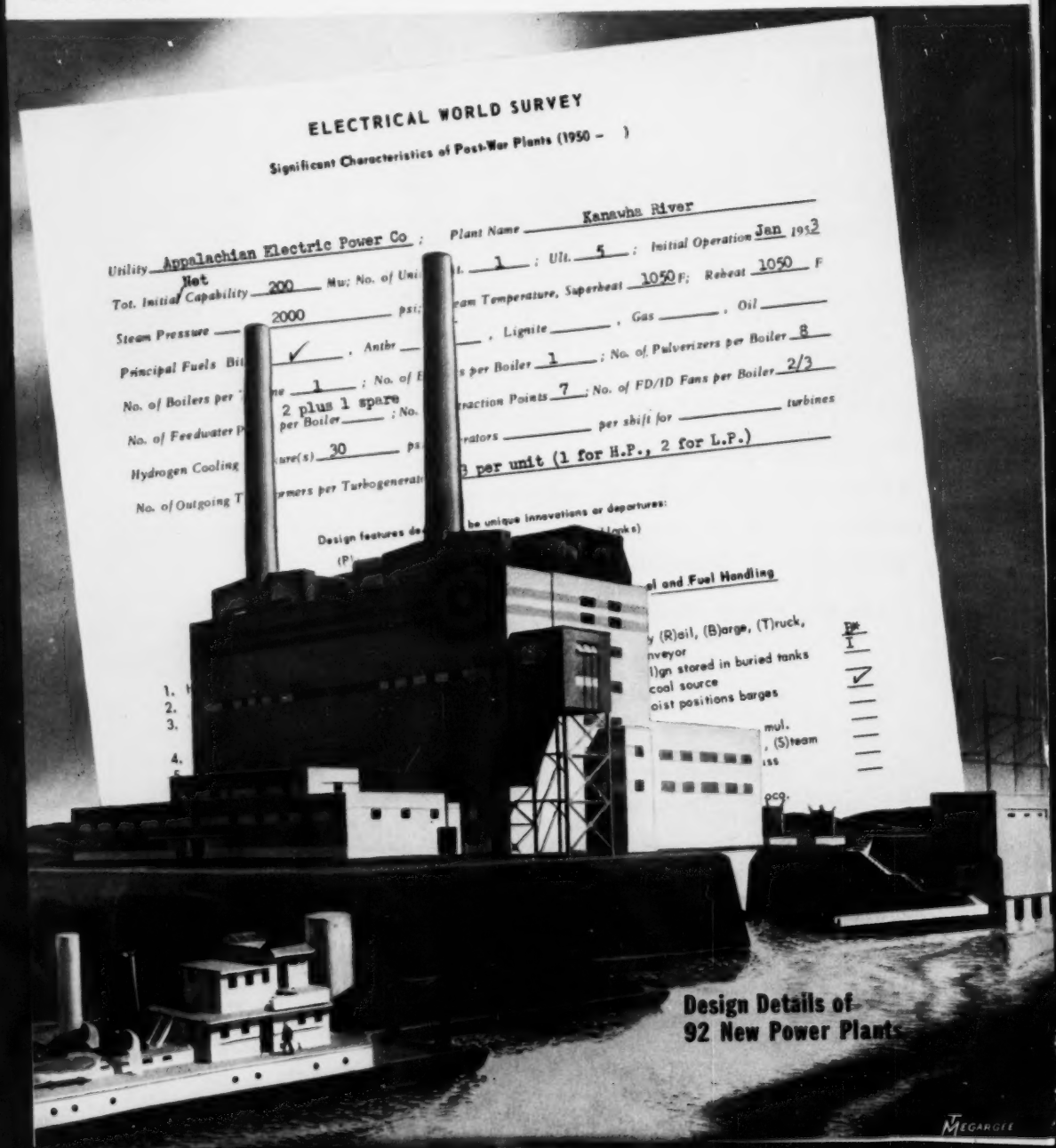
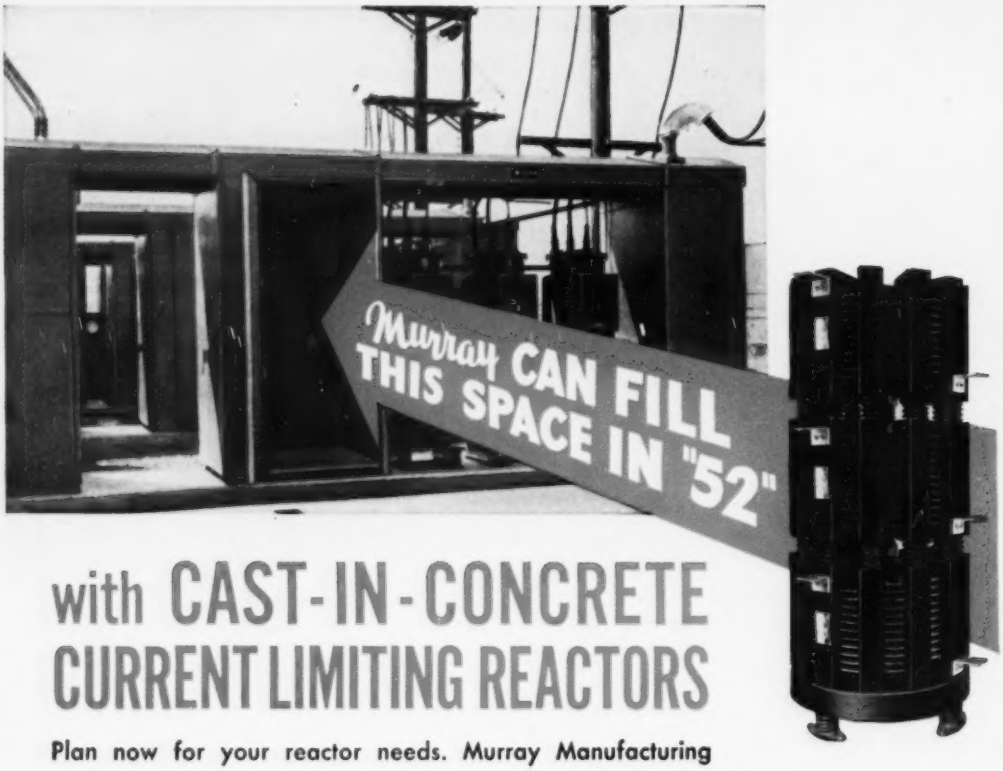

ELECTRICAL WORLD SURVEY
Significant Characteristics of Post-War Plants (1950 –)
Utility Appalachian Electric Power Co ; Plant Name Kanawha River
Tot. Initial Capability 200 Mw; No. of Uni
Steam Pressure 2000 psi;
Principal Fuels Bit ✓ , Anthr
No. of Boilers per
No. of Feedwater P
Hydrogen Cooling
No. of Outgoing T
Design features de
Design Details of
92 New Power Plants
MEGARGEE



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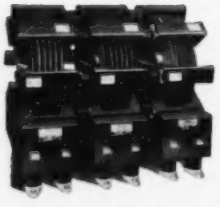

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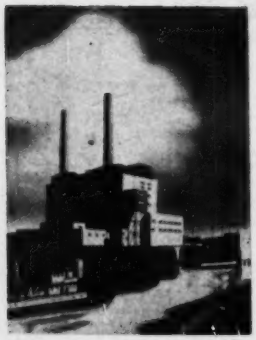

The picture of the Kanawha River Plant of Appalachian Electric Power Co which is the focus of the front cover was drawn by Tony Megargee, Central Hudson Gas & Electric Co artist. His father is Harry P. Megargee, director of public relations for American Gas & Electric Co, Aepco parent, which supplied the picture.

INTERTYING BRITAIN AND FRANCE

Power men in Britain and France have long dreamed of interconnecting them. Now the dream is approaching reality. An article in the April 14 issue will discuss the plans and problems. The most favored plan calls for a 25-mile-long submarine cable across the narrowest part of the English Channel. High-voltage dc is favored.

EEI COMMERCIAL MEETINGS

For commercial staffs of electric utilities the big week of the year is always that when the EEI Sales Conference is held. The 18th annual conference was held March 31-April 3 at Chicago. What was done and said there will be amply covered in the April 21 issue.

THE BEST LIGHTING JOBS OF 1951

WHAT were the best lighting jobs of 1951? The entries in the Gold Seal prize award competition, a feature of the 4th International Lighting Exposition, may provide the answer. Read about some of the 330 entries in the April 21 issue. Then see them May 6-9 at Cleveland.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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Your near-by Graybar warehouse is a convenient source of pole-line materials and supplies. You can rely on the local Graybar Representative to provide complete, accurate information about anything you require, as well as to arrange practical delivery schedules for items in short supply.

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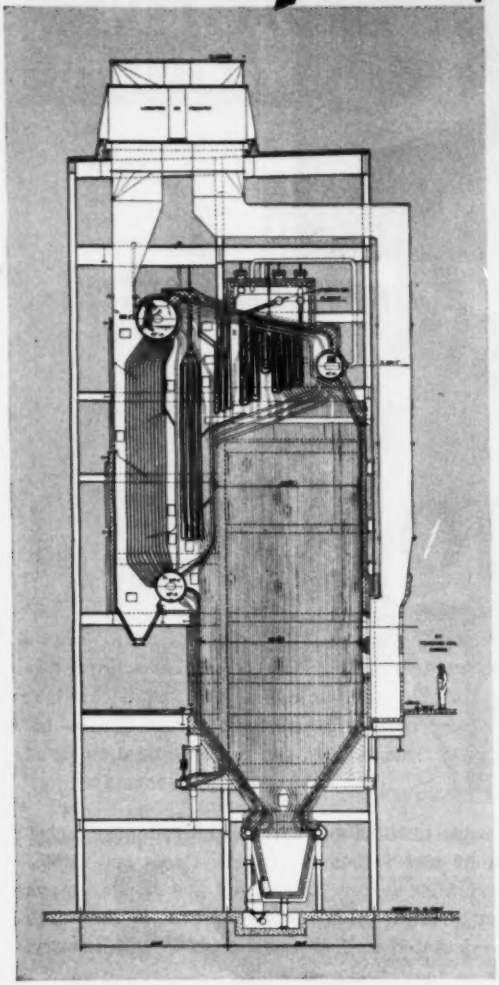
Installed 7 Riley Units Since 1947



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NOBLESVILLE STATION
3—300,000 lbs. /hr. Riley Units
1025 psig—950°F. Temperature

Public Service Company of Indiana Selected Riley Steam Generating Units for their latest additions to Dresser and Edwardsport Stations and also for their new Noblesville Station. Sargent and Lundy were Consulting Engineers.

Riley History of Public Service Co. of Indiana

First Order—July-1946
1—300,000 lbs./hr. Riley Unit for Dresser Station

Second Order—Sept.-1946
2—400,000 lbs./hr. Riley Units for Edwardsport Station

Third Order—July-1947
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Fourth Order—March-1949
Another 400,000 lbs./hr. Riley Unit for Edwardsport Station

Total 4 orders—7 Units—Total Capacity 2,400,000 lbs./hr.

All of these Public Utilities have Purchased Riley Steam Generating Units.

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Gulf Power Co.
Florida Power & Light Co.
Ohio Edison Co.
Southern Ind. Gas & Elec. Co.
Interstate Power Co.
Upper Michigan Power & Light Co.
Central Ohio Light & Power Co.
Natrona Power & Light Co.
Cambridge Electric Light Co.
West. Colorado Power Co.
Newport Electric Co.
Northwestern Public Service Co.
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The Potomac Edison Co.
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Central Illinois Light Co.
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Northern Virginia Power Co.
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SIMPLEX TIREX

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"Transmission" Type Protection for Distribution Lines

14.4 and 23 kv PACIFIC Type JCE

Motor-Compressed-Spring

OIL CIRCUIT BREAKERS

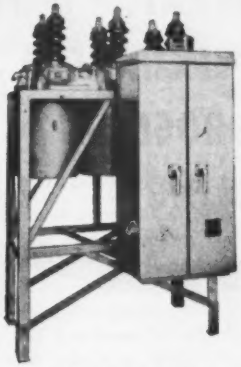
Shipped Assembled, Tested, and Adjusted

NEMA and ASA STANDARD Electrically and Mechanically Trip Free

Advanced Protective Performance—usually found only in large breakers for transmission lines—carries through even to the small PACIFIC Oil Circuit Breakers

At left: JCE-22 250,000 int. kva with end-mounted mechanism

At right: JCE-17 100,000 int. kva with side mounted mechanism



Also supplied, as above, with side-mounted operating mechanism for use where lengthwise space is at a premium.

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Amp 14.4 kv:	Interrupting Kva
600	100,000
600	250,000
1200	250,000
23 kv:	
600	250,000
*1200	500,000

*Type JE

Sales Offices or Agencies in Principal Cities

AS ALL Closing is from release of motor-compressed springs, any closing when once started is always under full force, regardless of drop of control voltage.

Thus when closing against fault, the blades cannot "drift in" when control voltage is low. Protection is thereby assured against the possibility of magnetic blow-back which might open the "a" auxiliary switch before the relay can close the tripping circuit. Slow opening and failure to interrupt are thereby eliminated.

Other features insuring reliability:

- Only one moving part in each tank —the one-piece rotary contact structure—under no stress except when operating;
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- Control current no greater than tripping current — large wires not required;
- Full a-c if desired — without rectifiers;
- Emergency manual closing at full speed.

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First with Super-

ALLIS-CHALMERS INSTALLS STEAM TURBINE GENERATOR UNIT WITH SUPERCHARGED HYDROGEN COOLING

SUPERCHARGED HYDROGEN COOLING—the greatest advance yet made in turbine-generator design—is here *now*. This 60,000 kw unit is installed and running at the Edgewater station, Sheboygan, of the Wisconsin Power & Light Company.

Allis-Chalmers is first to develop and apply the principle of directly cooling the conductors with high velocity gas. This unit is the pioneer of a new design trend. Following operating experience, the utility ordered two more similar units, with reheat, for its new Rock River station.

As compared to the 35 percent output gain hydrogen cooling gives over air cooling, supercharged hydrogen cooling increases generator ratings *70 percent* over ordinary hydrogen cooling. Significant gains are made in increasing light load efficiencies and decreasing foundation and building requirements!

The Edgewater turbine has these outstanding features:

Hydraulic control and operation with accessible placement of main stop valve; centralized grouping of operating controls; shaft-driven centrifugal pump simplifying location of oil tank; cam-operated inlet valves accessibly located on top of cylinder, and exclusive A-C method of temperature compensation for horizontal *and* vertical thermal movement.

All oil piping is above the floor, simplifying foundation and installation. And, as throughout the complete Allis-Chalmers line — ranging from the smallest single cylinder machines to single shaft, tandem compound, condensing units of 150,000 kw — labyrinth steam seals are used. The steam sealed gland system is self-contained, and provides operational safety with minimum attention.

You get the real design advances *first* from Allis-Chalmers. When planning the installation or expansion of a steam-electric power plant, let A-C simplify your problem. This *one* source will provide you with the world's widest range of power plant equipment. Bulletin 03B6801A on standardized steam turbine units and other literature on all products listed are available. For your copies, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis.

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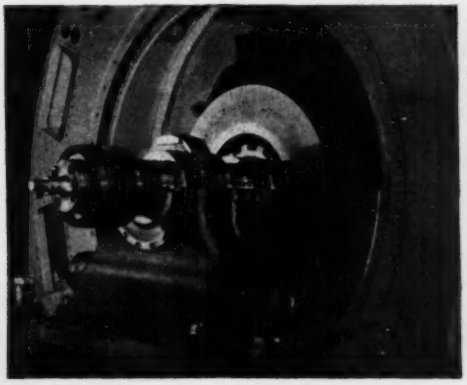
Charged Cooling!

Other ALLIS-CHALMERS FIRSTS

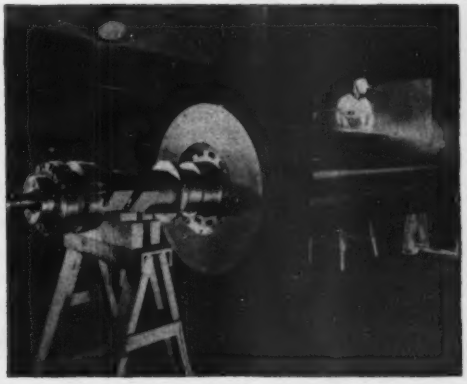
Simplified hydrogen seal and control
World's lowest exhaust pressure steam turbines
Solidly-bolted-down steam end pedestal
Turbine for one-boiler-per-turbine arrangement
"Walk-in" exciter housing
30,000 Kw, 825 F turbine, in 1931
825 F reheat turbine, in 1935

AND NOW . . . **First with supercharged hydrogen cooling!**

This 60,000 kw, 3600 rpm AIEE-ASME preferred standard unit is driven by an Allis-Chalmers tandem compound steam turbine. Steam conditions are 1250 psig, 950 F, 1½ in. Hg abs exhaust. The Edgewater station consists of this and two Allis-Chalmers 30,000 kw units.



Twenty years of Allis-Chalmers blower experience aided in the design of the new rotor ventilating system. The two stage centrifugal compressor at the exciter end of the rotor "supercharges" the hydrogen to several times the pressure obtained from the usual cooling fans. Its output is cooled separately and directed into the rotor from both ends.



Shop view of rotor during construction. Instead of being sent to vent ducts in the rotor teeth, the hydrogen is directed *through* the rotor conductors. The gas is in intimate contact with the copper right where the heat originates. This improved ventilation permits a reduction in unit length and consequent reduced building space requirements.

PROVED
PROTECTION FOR YOUR
POWER LINES
CRYSTAL VALVE VENTILATED GAP ARRESTER
High speed, multiple spark gaps kept free of corrosion by vents which permit movement of air and prevent accumulation of moisture in the housing. Glass housing makes gap inspection easy—condition of spark gap assembly readily seen at all times without removing arresters for testing. Amazing all-round performance is proved by thousands in service with almost 100% record of protection.
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GIVES YOU...

15 WAYS TO CUT THE COST OF BATTERY OPERATION!

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3. Make Periodic Inspections.
4. Keep Accurate Records of Charging and Repairs.
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14. Schedule Regular Maintenance Procedures.
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Metropolitan Edison Co.
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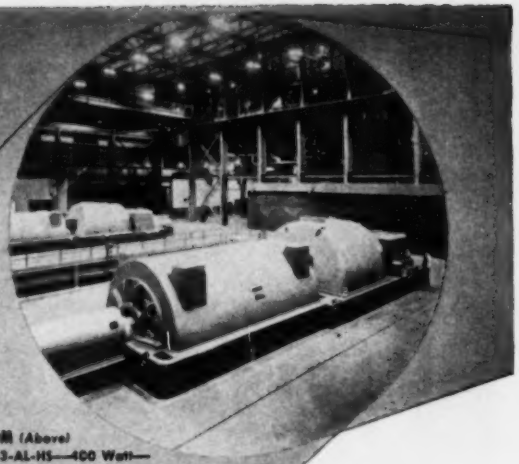
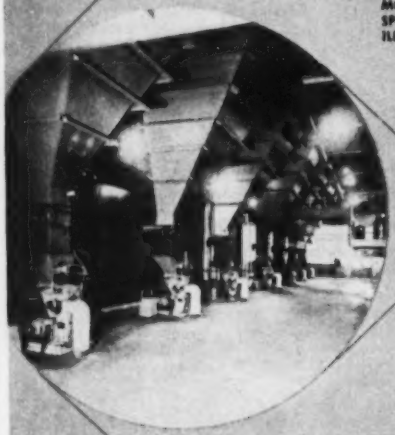


TURBINE ROOM *(Above)*
HIBAY NO. 693-AL-HS—400 Watt—
E-H1 Mercury Lamp
HIBAY NO. 690-AL-HS—750 Watt—
Incandescent Lamp
installed as twin units.
MOUNTING HEIGHT: 40 feet
SPACING: 17' x 28' on centers
ILLUMINATION: 30 footcandles in service



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BOILER ROOM *(Below)*
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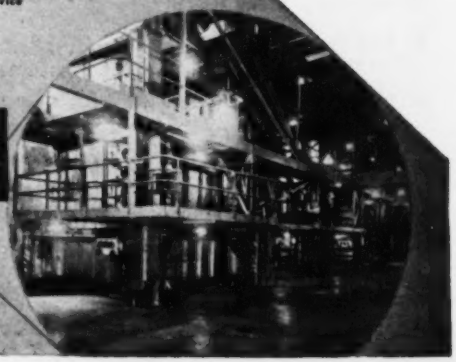
NOS. 02470, 02470-BC—150 Watt
ILLUMINATION:
Platforms—10 footcandles in service
Aisles—25 footcandles in service



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Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N. Y.
THE HOLOPHANE COMPANY LTD · THE QUEENSWAY · TORONTO 14, ONTARIO

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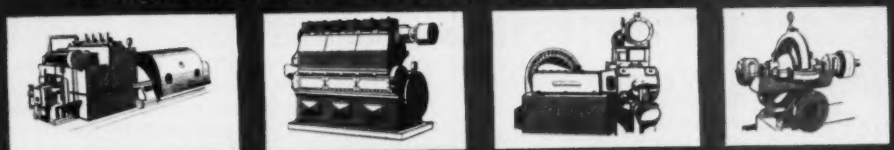
MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

The Right Oils for Turbines, Diesels...Every Machine in Your Plant



BACKED BY THE WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

Exide-Manchex installation in City of Philadelphia Substation No. 4

Substation No. 4, power source for part of Broad Street Subway. Operated by Philadelphia Transportation Company, largest privately-owned, unified transit system in America.

"TRIPPING" ON THE BROAD STREET SUBWAY

Exide-Manchex BATTERIES

More than 90,000,000 passengers a year ride on Philadelphia's city-owned, PTC-operated Broad Street Subway. Directly, and through its many feeder lines, the subway serves a large part of the city and adjoining areas. Safety and service records are high. Equipment is modern, efficient . . . and includes dependable Exide-Manchex Batteries.

Power for the northern section of the subway is normally supplied from Substation No. 4 by three 3000-KW Rotaries. They receive current from the Philadelphia Electric Company, at 13.8-KV, over cables. The station's six, motor-operated oil circuit breakers and five D.C. solenoid-operated air breakers, are powered by Exide-Manchex Batteries, which also provide emergency lighting throughout the station.

EXIDE-MANCHEX BATTERIES ARE PREFERRED BY MANY UTILITIES BECAUSE THEY ASSURE:

POSITIVE OPERATION: Dependable performance at ample voltage with no switching failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for dependable performance of all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution needed during life of battery.

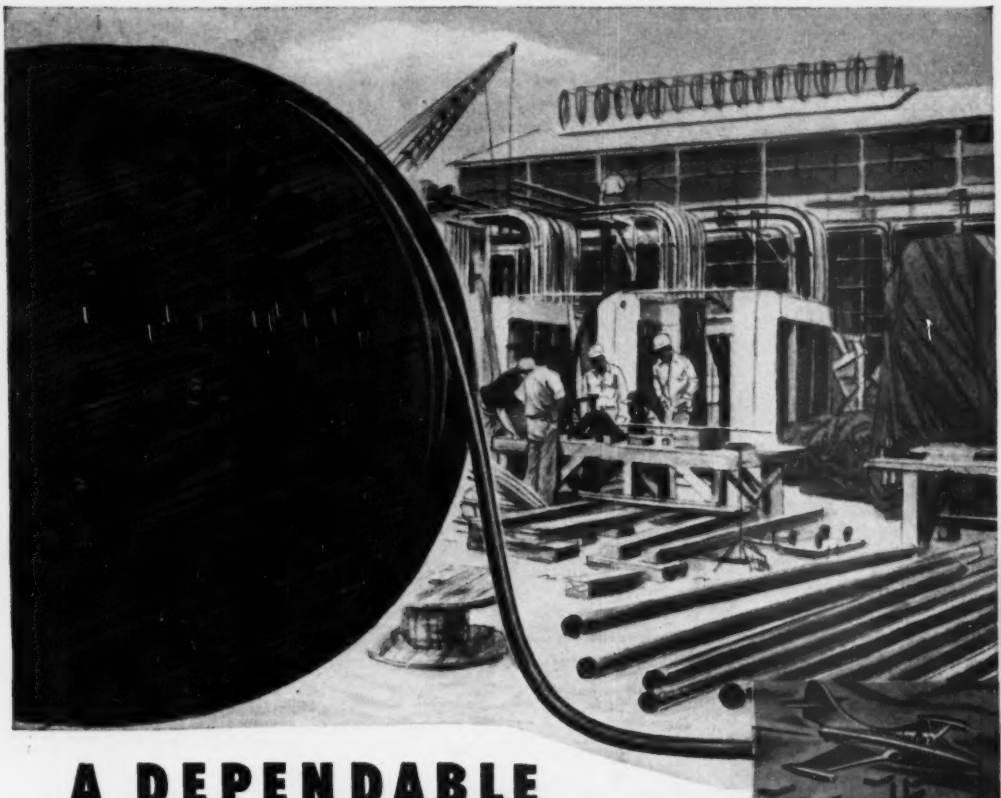
LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding of equipment.

These features combine to make Exide-Manchex *your best power buy* for all control and substation services.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" and "Manchex" Reg. Trade-marks U. S. Pat. Off.

1888 . . . DEPENDABLE BATTERIES FOR 64 YEARS . . . 1952



A DEPENDABLE SIGN...

that America is expanding

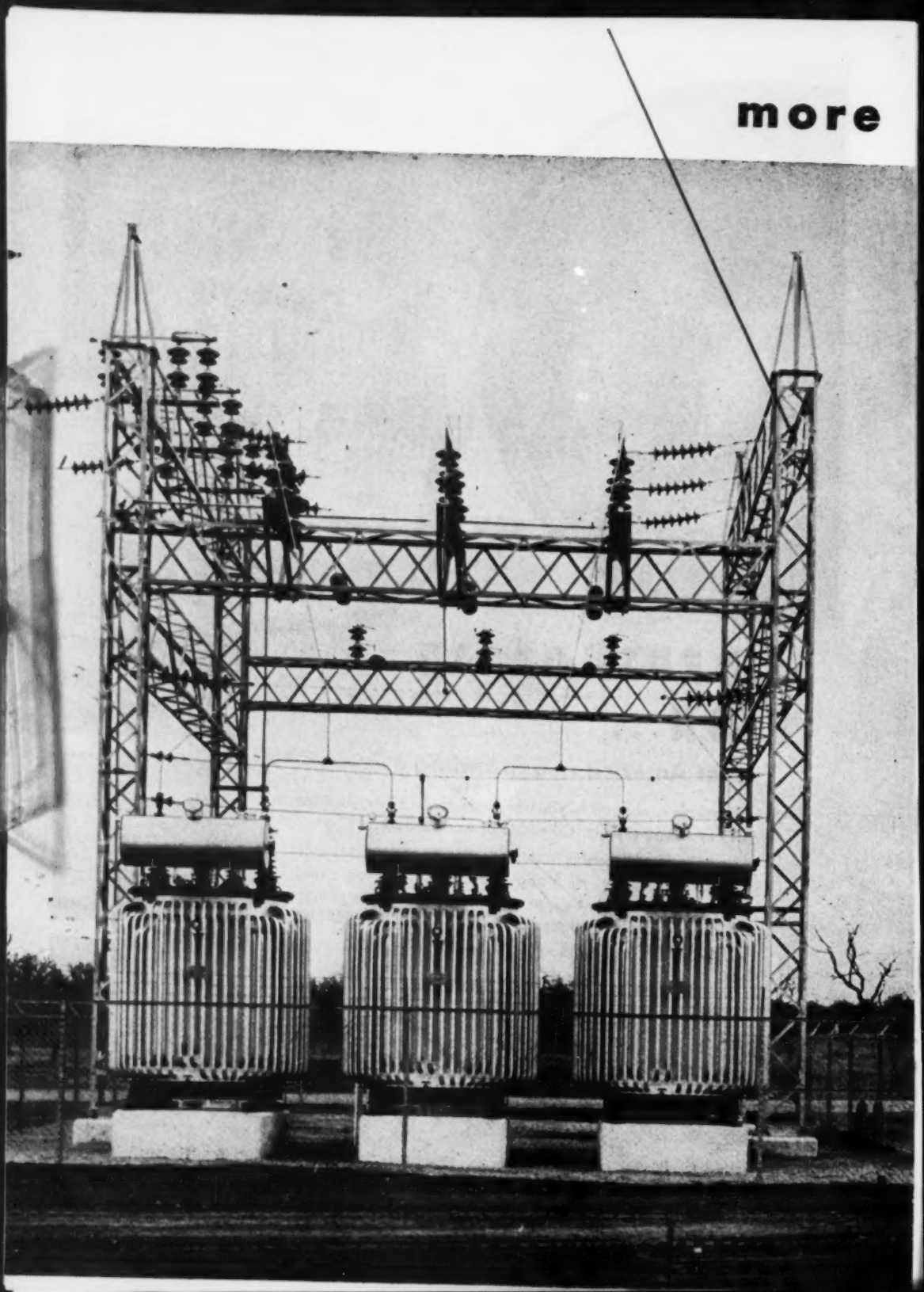
Thanks in great part to you who harness electricity, America is expanding rapidly in the face of world tension.

As America strengthens its defenses, the YELLOW TRIANGLE REEL and the stack of Triangle conduit become more and more familiar sights. Engineers and contractors—demanding quality wire, cable and conduit—know that ***YOU CAN DEPEND ON TRIANGLE and on the ELECTRICAL DISTRIBUTOR.***

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"Glazon" Building Wire · "Glazon" Non-Metallic Sheathed Cable · Control Wire · Armored Cable · Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Triprene Trench, Power & Parkway Cables · Bare Wire · Rigid Conduit Hot-Dipped Galvanized & Black Enameled · Electric Metallic Thin Wall Conduit · Flexible Steel Conduit.


more

power for Texas oil

A big industry like the oil industry needs reliable equipment. That's where Kuhlman comes in. These three Kuhlman Power Transformers—each 1500 KVA, single phase, rated at 69 KV—are part of the pumping system of one of the world's largest pipeline companies, located in Texas.

This company, along with many other transformer users, knows that the name Kuhlman represents 58 years of expert engineering and solid construction.

It is significant that Kuhlman, a pioneer in transformer manufacture, continued to find ways to improve an already highly standarized product. Many of these improvements are now standard.

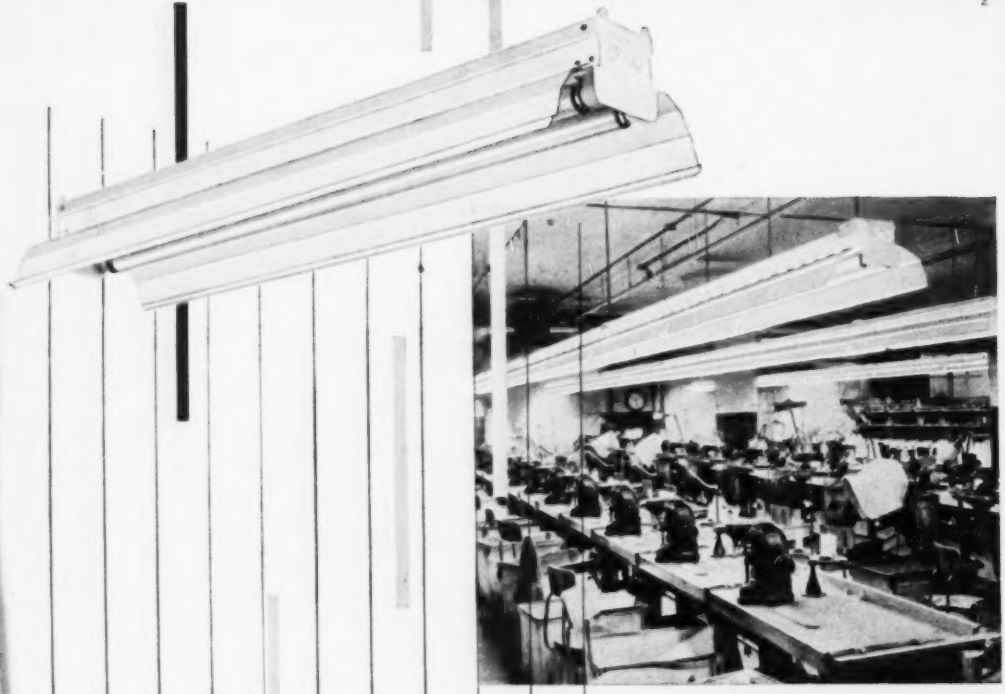
Whenever you have a transformer requirement—large or small—call the Kuhlman representative in your vicinity. If you don't have his address, write us.

Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

The complete Kuhlman line includes power, distribution, dry type, Sal-T-Kuhl, and specialty units. Write today for descriptive bulletins. For information on power transformers, ask for Bulletin CS-601.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N.Y. Cable Address, Microphone, N.Y.



miller leaders in lighting since 1844

factories
offices
schools
stores
public buildings

Miller lighting systems give you the maximum benefit of *proper* lighting. Easy, accurate vision for best accomplishment. They are engineered for easy installation—for low maintenance—for long service—for finest dollar-for-dollar value. Behind them are 108 years of pioneering and progress in GOOD LIGHTING.

There's no need to compromise on lighting that's "almost" right. Miller has a complete line of luminaires—Fluorescent, Incandescent, and Mercury-vapor—that cover a wide range of industrial and commercial lighting requirements—that have been proven in thousands of installations.

Light with confidence the *proven* Miller way. Miller field engineers and distributors are conveniently located for nation-wide service.

Luminaire shown is the new Miller Slimline 50 Foot Candler Jr. It gives industry the ideal *PLUS* combination of up—and—down lighting. DOWN-LIGHT for overall illumination, *plus* UP-LIGHT—from new apertured top reflector to minimize brightness contrast.

THE miller COMPANY MERIDEN, CONN.
SINCE 1844

ILLUMINATING DIVISION **HEATING PRODUCTS DIVISION** **ROLLING MILL DIVISION**

Here are

THREE NEW KEARNEY PRODUCTS

for Dead-Ending Self-Supporting Bare Neutral Service Cable...

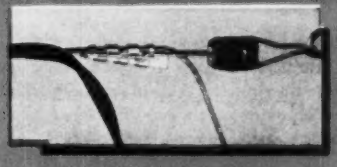
INEXPENSIVELY • EASILY PERMANENTLY

1 The Kearney Wedge-Tite Clamp is built with a serrated wedge that grips the bare wire with a force proportional to the strain put upon it. This strain is not transmitted to the insulated conductors thus eliminating insulation creep and the danger of leakage and shorts.

2 The Cable Tie is installed in front of the Wedge-Tite Clamp, securing the insulated wires to the bare neutral thus preventing separation of the conductors.

3 The Drop Wire Hook is an inexpensive, easily installed (lag screw) method of anchoring the Wedge-Tite Clamp at the service entrance.

A typical installation using a Kearney Strain Insulator Assembly, Cat. No. 17590



For additional information on Kearney Pole Line Accessories turn the page...

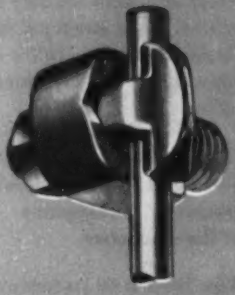
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant—Guelph, Ontario

JAMES R. KEARNEY

Increase Efficiency Reduce Maintenance with KEARNEY pole line equipment

NEW KEARNEY RUST CUTTER

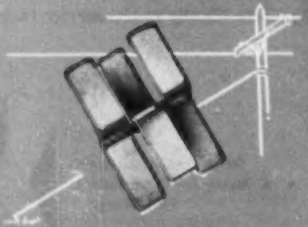
To eliminate time wasted in loosening ferrous nuts, bolts and other hardware because of corrosion, simply spray Rust Cutter from its self-contained, pressurized can. Chemical is automatically atomized. Fine mist reaches every rust particle on threads, etc. Action is complete in a few seconds. A film of long lasting graphite remains thus helping prevent future galling.



TRANSFORMER GROUNDING LUG

Fits All Transformers Equipped with Threaded Grounding Pad

To provide a low-resistance ground connection, Kearney recommends this bronze transformer grounding lug. Ground wires are securely fastened quickly, easily. Accommodates ground wires from No. 6 solid through No. 1 stranded copper.



Serve Guy Wire Strand Ends Permanently with the KEARNEY FINGER GRIP GUY CLIP

To use this clip no special tools are required and it is impossible to position incorrectly. These clips are easily inserted between the strands, and tabs are bent around the wires. Clip is made of aluminum and will outlast the strand itself. Faster and neater than using waste strand.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo. • Canadian Plant—Guelph, Ontario

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

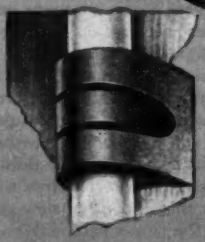
Designed to help your linemen do a BETTER job FASTER

Seal Out Oxidation and Corrosion on Any Connection with KEARNEY AIRSEAL

Kearney Airseal is a pliable high-dielectric compound which is chemically inert. It is the most nearly perfect material on the market today for sealing out moisture, oxidation and corrosion.

Airseal is applied by kneading it over the terminal or connector to be protected, forming a protective coating impervious to moisture and contaminated atmospheres. For any connection protection problem—investigate Kearney Airseal.

Eliminate Radio Interference— Use KEARNEY *NON-STATIC* GROUND WIRE CLIP



Ordinary staples are entirely inefficient in securing ground wires because the contact pressure is dependent upon their hold in the wood and loosening causes air gaps to develop between staple and ground wire. These air gaps cause radio interference.

Illustration at right quickly shows you how the Kearney NON-STATIC Clip completely eliminates the air gap and resultant interference because the pressure between the clip and wire is entirely independent of the clip's grip in the wood.

1 Drive clip until point seats firmly in wood. Insert grooved wire under hook.

2 Drive until hook grips wire and starts to protrude through slot in body.

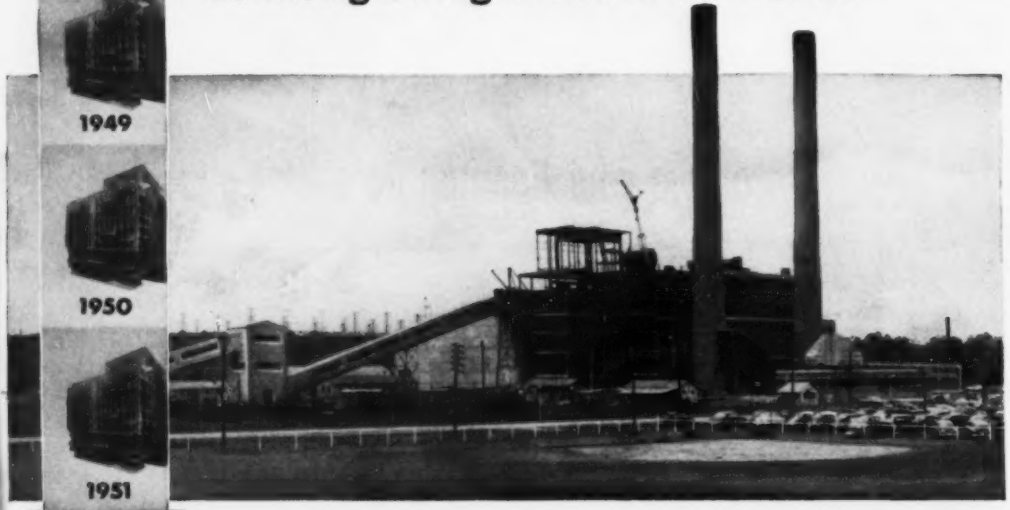
3 Bend end of clip over wire into wood.

KEARNEY *Gives a Little More for a Little Less* — *Through Engineering*

Indianapolis Power & Light Installing

FIVE I-R RECTANGULAR CONDENSERS

at fast-growing White River Station



OTHER I-R EQUIPMENT
in the Station
Boiler-feed pumps
Condensate pumps
Circulating-water pumps
plus many
smaller pumps

When the fifth turbo-generator goes on line, as scheduled for December 1953, the Indianapolis Power & Light Company's White River Station will have increased its capacity from 90,000 kw to 271,000 kw in less than four years. *All five* turbines in this station will be served by *complete Ingersoll-Rand condensing plants*—Rectangular Condensers, steam-jet ejectors, condensate pumps and circulating-water pumps. Gibbs & Hill, Inc. are the consulting engineers on this fast-growing White River Station.

The first two I-R Rectangular Condensers, each containing 30,000 sq ft of condensing surface, were installed in 1949 and 1950 to serve two 45,000 kw turbo-generators. The third condenser, now being installed, is identical and will serve a duplicate 45,000 kw turbine.

It was originally planned to add another 45,000 kw unit. But, because of the increased power demand, the fourth turbo-generator will have a capacity of 68,000 kw . . . due on line in 1952. It will be served by a 40,000 sq ft I-R Rectangular Condenser with complete I-R auxiliaries.

Unit No. 5, to be installed in 1953, will be another 68,000 kw machine, with a duplicate I-R 40,000 sq ft condensing unit. In addition, Ingersoll-Rand boiler-feed pumps and a host of smaller I-R pumps will be serving right along with all the condensing equipment.

Ingersoll-Rand Rectangular Condensers, like these five, save space and installation costs, because the rectangular shell is designed to *fit* the rectangular space available under the turbine. They are completely factory assembled and shipped *in one piece* or *in flanged sections* that can be bolted together without field fitting or strength welding.

Your nearest I-R representative will gladly discuss this and other new developments in the power field with you.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 728-4

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

. . and get

PERMANENT POLE PROTECTION

at LOWEST COST

with

Copperweld GROUNDING WIRE

Cut your costs and make your supply of copper go further by using annealed Copperweld* Grounding Wire, in place of copper. For pole protection, Copperweld saves 70% of the copper. What's more, it costs less than copper.

Remember, high frequency discharges travel along the outer surface of a wire. Because of this skin effect, Copperweld can carry lightning currents as well as a solid copper wire of the same size.

Copperweld Grounding Wire also discourages theft, as it is readily identified. Strong, yet pliable, it is easy to install and is permanently protected against corrosion.

The advantages of annealed Copperweld Grounding Wire have been demonstrated through installations in many localities. For further information on this dependable, low-cost, copper-saving product, write us today.

*Trade Mark

COPPERWELD STEEL COMPANY *Glassport, Pa.*

SALES OFFICES IN PRINCIPAL CITIES

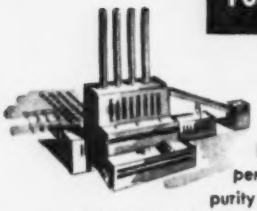
Copperweld Grounding Wire

From the pioneering development in Superheaters to the

the trend in modern steam generator design

places the spotlight on . . .

FOSTER WHEELER combination radiant and convection



Today's central station calls for larger unit sizes of turbines and boilers—higher steam pressures and temperatures—and optimum quality and performance. To provide steam in the quantity, pressure, temperature and purity demanded, increased emphasis falls upon the design and function of superheaters and reheaters. Their integration with other components of equipment and plant requires the high degree of skill and experience that comes only with years of leadership in the field.

Foster Wheeler's pioneering effort in steam generator design, as reflected in the following record of achievement, has led the way for every major development in the reheat cycle.

1902 — Superheated steam introduced commercially in the United States.

1904 — Convection superheaters standardized with cast iron extended surface rings applied to steel tubes. Bare tubes were later used with improved design technique and improved metal selection.

1919 — Radiant superheaters developed after long research and experimentation.

1924 — Water walls and water backs applied to many types of furnaces burning various fuels.

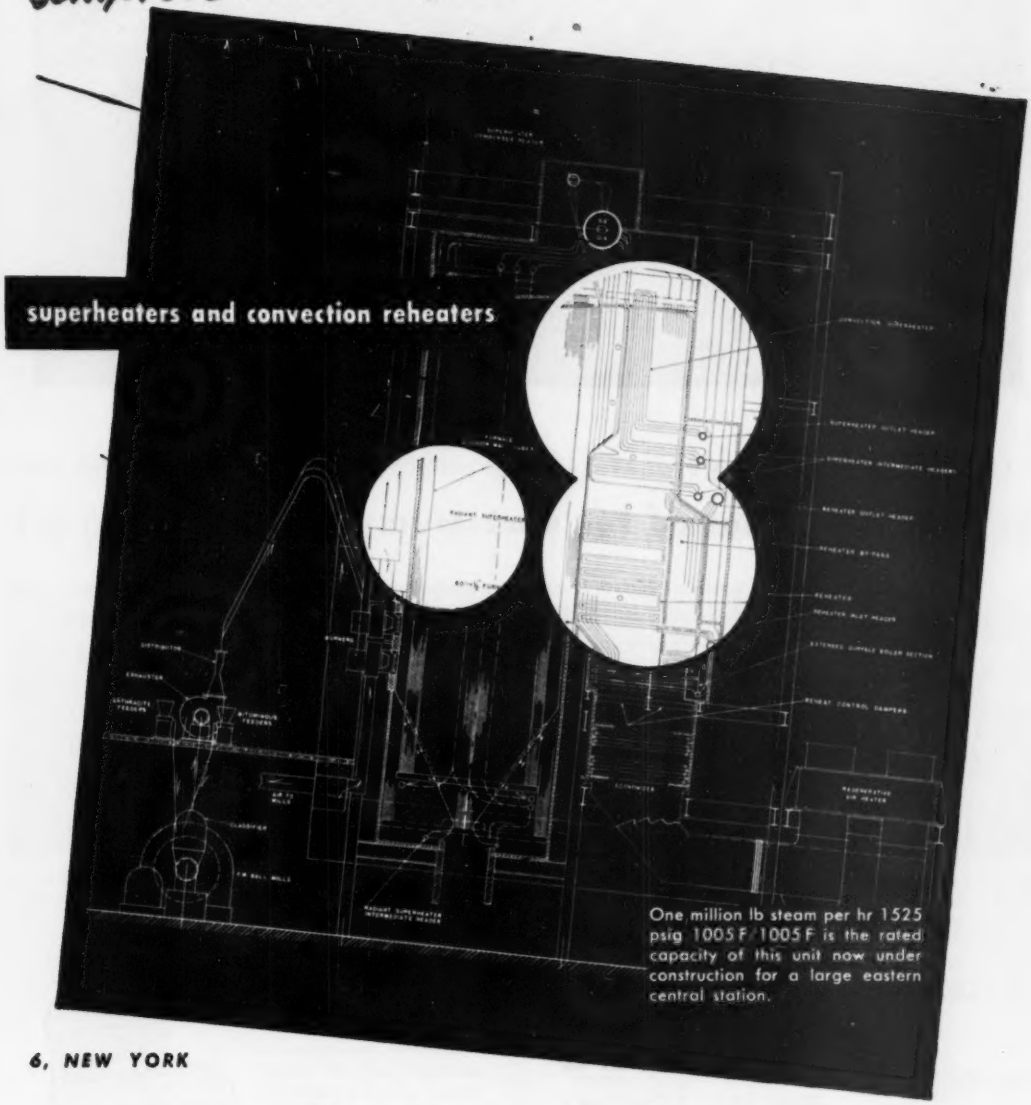
1926 — Radiant reheaters and radiant superheaters installed in one of the first large high pressure reheat units in the country.

1946 — First large steam generator installed in a central station to operate over a wide load range at 1000 F final steam temperature.

As a result of this 50 years' background of experience and leadership, each new steam generator can be depended upon to have Foster Wheeler's integrated quality and performance.

FOSTER WHEELER CORPORATION • 165 BROADWAY • NEW YORK

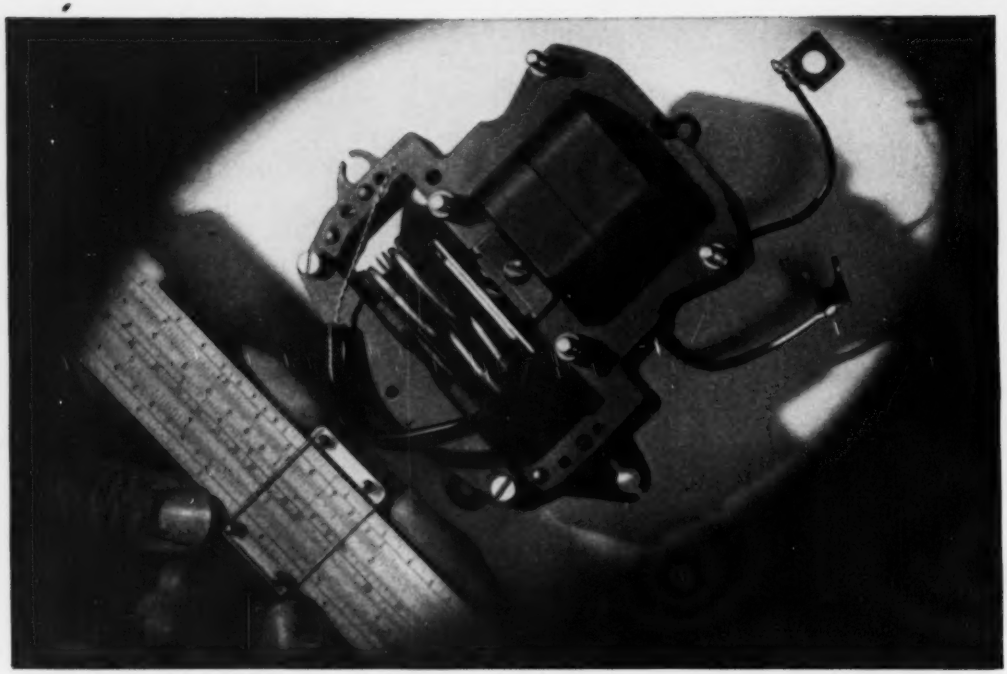
complete reheat cycle



One million lb steam per hr 1525 psig 1005 F/1005 F is the rated capacity of this unit now under construction for a large eastern central station.

6, NEW YORK

FOSTER WHEELER



Sangamo J Meters

designed for maximum stability

Sangamo Type J Watthour Meters have a factual record of sustained high accuracy. This high accuracy is no accident. Important electrical and mechanical features have been combined with skilled manufacturing techniques and the latest statistical quality control methods in order to embody the desired quality characteristics into these meters.

With maximum stability as the principal design goal, liberally designed potential and current elements combine to insure accurate registration from the lightest loads to loads well over four times the nominal current rating.

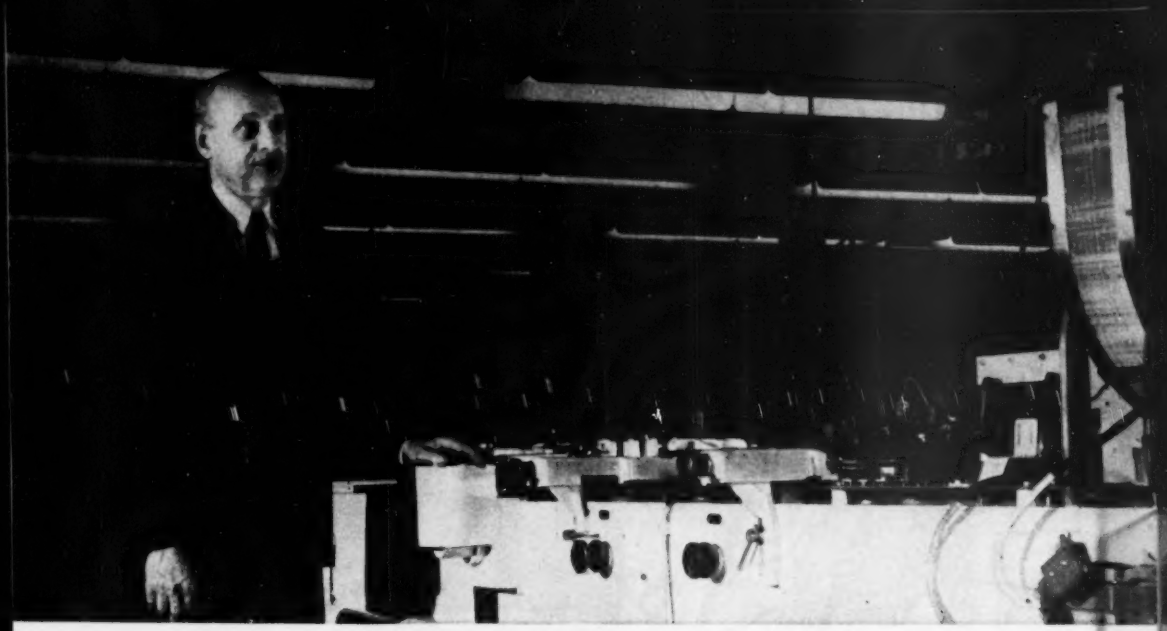
The exceptionally high driving power of the Sangamo J Meter is another important factor in assuring its stable registration. There is ample torque in the moving system so that at light loads increases in friction rarely affect registration.

Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

SM52-4



"What a variety of packaging machinery Standard-Knapp makes . . . machines for packing gum to packing 300-lb. TV sets. It's a changing, growing field that needs a flexible, expandable power distribution system. We chose Trumbull's FLEX-A-POWER because this system of pre-fab busways, in standard lengths, could be taken apart, added to or decreased to meet expanding or contracting power needs. A few thousand dollars' worth of FLEX-A-POWER was installed when we built our first plant years ago, and many thousands of dollars more have been added since then. That's real flexibility – with no waste. Not a single FLEX-A-POWER length or tap-off device has been obsoleted. Let me show you how it works . . .

BILL SCHAEFER, ENGINEERING CONSULTANT FOR STANDARD-KNAPP, DEMONSTRATES—

The power distribution system of the future—in action today!

"We get power where it's needed, *when* it's needed, at presses and machine tools located at many different points," explains Schaefer, "by this method: LVD (Low Voltage Drop) FLEX-A-POWER feeds this packaged Trumbull Centr-A-Power switchboard from an outside transformer, then a network of FVK FLEX-A-POWER, the secondary or plug-in distribution system, takes off from there and criss-crosses the whole plant. There's an FVK outlet every foot of the way.

"It's so much easier and more economical to install than wiring and conduit," points out Schaefer. "There's no expensive rewiring, either, when relocating loads. Just dismantle FLEX-A-POWER, move it to the desired location and reinstall it —with practically 100% reuse of materials. It's the only method that permits quick changes in machine layout without delay for rewiring. Yes, sir, the power distribution system of the future is a present reality!"

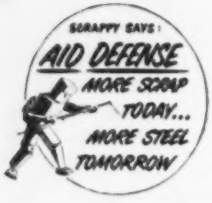
There's a FLEX-A-POWER type for your application—whether multi-story building or industrial. Though FLEX-A-POWER is now mainly for defense, the present's the time to plan for your future power needs. Write for full data.

Trumbull Assures FUTURE FLEXIBILITY *in Power Distribution*

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONNECTICUT

Grandpa Never Threw a Thing Away



It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

The steel industry needs these millions of tons of dormant scrap, needs it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

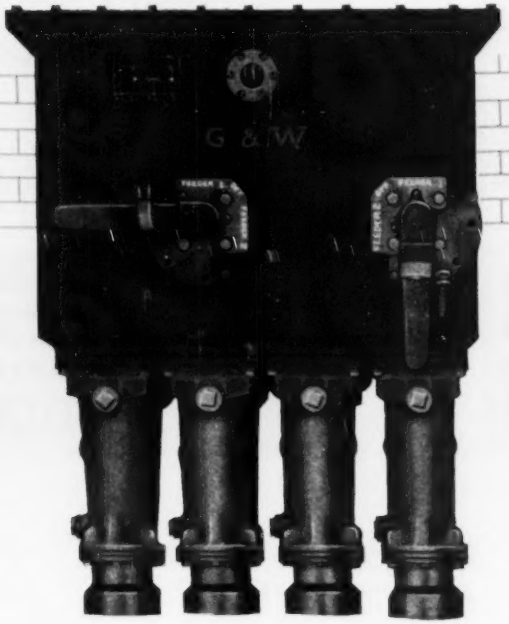
Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

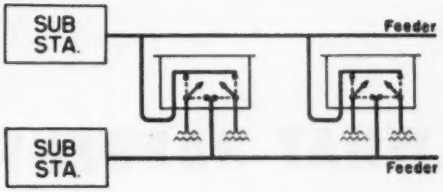
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

More Scrap Today...More Steel Tomorrow

AVOID SHUTDOWNS BY TRANSFERRING LOADS WITH G & W LOAD BREAK OIL SWITCHES





"RAJ" OIL SWITCHES

The Type "RAJ" is a 4-way load break* oil switch with busses and two sets of links for interconnection of two feeds and two load circuits.

Lengthy shutdowns are avoided by transferring loads to an alternate feeder when the primary power supply fails. Each load can be supplied separately or both can be connected together to either feeder.

"RAJ" switches are housed in a heavy, completely sealed, welded steel tank suitable for installation in subway, overhead, or exposed locations. Standard ratings are 7500, 15,000 and 23,000 volts with a continuous current carrying capacity of 400 amperes.

***Non-load break switches also furnished for ASKAREL filling.**

Send for Bulletin AB51, which gives complete data and prices.

G & W Bulletin H-48 shows system layouts for "Primary Cable System Flexibility". Send for your copy. There is no obligation.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Ill.
Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices Ltd. Toronto and Montreal

FLASHOVER DISTANCE LOST	16%
LEAKAGE DISTANCE LOST	32%

FLASHOVER DISTANCE LOST	68%
LEAKAGE DISTANCE LOST	83%

WHAT HAPPENS on your lines WHEN

Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK

FLASHOVER DISTANCE
LOST 1%
LEAKAGE DISTANCE
LOST 7%

AN INSULATOR PETTICOAT GETS KNOCKED OFF?

If damage from flashover and mechanical attack is a major cause of transmission insulator replacement on your system, consider this fact. Lines on Lapp Line Post insulators almost never suffer outages due to insulator failure. In fact, most operators don't even bother to replace Lapp Line Posts that have flashed over or have been hit by stones or bullets. The reason is in the Line Post design—flashover or mechanical attack, of severity sufficient to shatter ordinary insulators, will break off one or two petticoats at the most, leaving the Line Post body intact, flashover and leakage distances only negligibly decreased, essential efficiency unimpaired. The result is in the maintenance records of hundreds of companies—records showing that *lines on Lapp Line Posts have fewer outages, require fewer insulator replacements and less maintenance than comparable lines on any other type of insulator.* The odds are all on your side when you build your transmission lines on Lapp Line Posts—for maximum performance, maximum economy.

Now, FWD builds a light-duty model, too!

And it's available in *standardized* combinations with boring machines, winches, derricks and bodies to fit your work.

An FWD earth boring rig with full-torque power take-off mounted on the new LD chassis.

The LD is a natural choice for materials transport. 14,500 lbs. gross vehicle weight.

This LD is a mobile "platform" for low cost, efficient tree trimming.

Look into the dollar savings and performance you can get with the new LD! This *light-duty* model has brought acknowledged FWD advantages to an entirely new FWD work range. AND — you can get the LD complete with the exact type of body and equipment you need! FWD is the *central source* for complete mobile workshops (78 combinations) . . . including cabs, winches, derricks, boring machines, platform and line bodies. Get full facts from FWD or a nearby FWD distributor. The Four Wheel Drive Auto Co., Clintonville, Wisconsin, and Kitchener, Ontario.

Built by the makers of America's Foremost Heavy-Duty Trucks

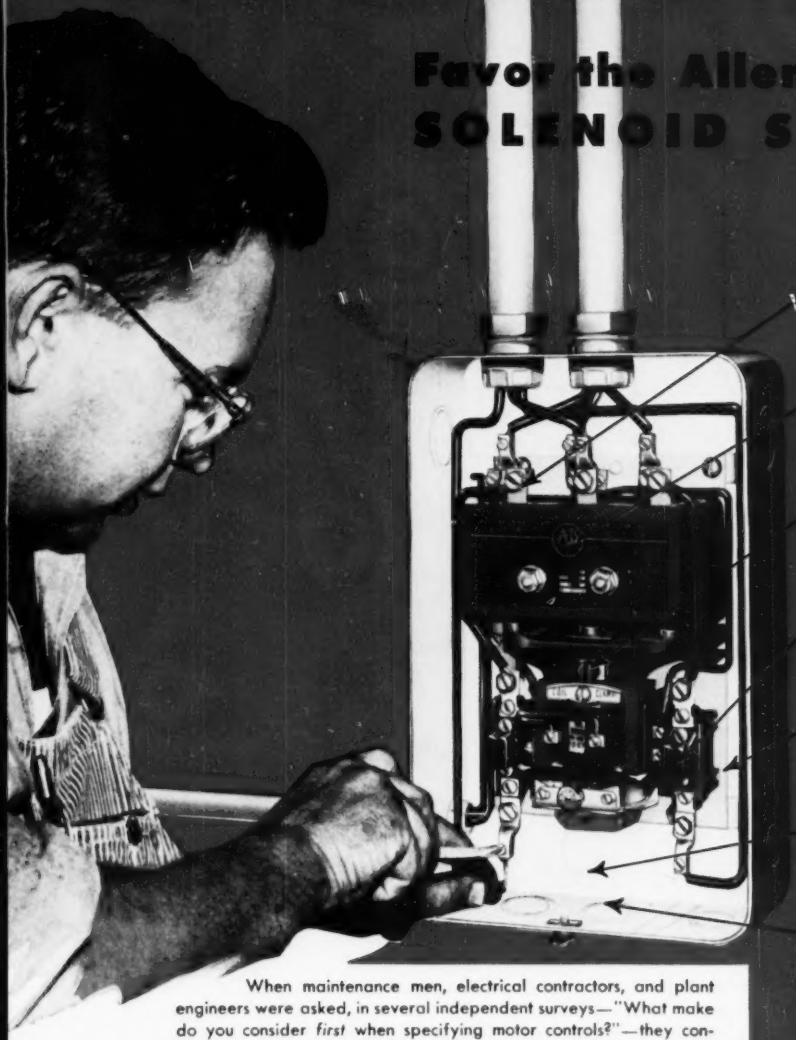
You buy more than a truck when you buy an FWD

Extra traction and proper distribution of weight and power give you all this:

- Ability to follow the job safely, on or off the highway.
- Ability to restore service faster — meet construction schedules — regardless of weather.
- Lower maintenance cost (up to twice the tire life).
- Up to twice the truck life.

World-Wide Sales and Service

Why *Maintenance Men* Favor the Allen-Bradley SOLENOID STARTER



ACCESSIBLE TERMINALS
Front connected—easy to get at. Ample space for motor and control wiring. Lots of knockouts.

NO CONTACT MAINTENANCE
Double break, silver alloy contacts never need filing, cleaning, or dressing for perfect operation.

ONLY ONE MOVING PART
One-piece plunger has no bearings to stick, no pivots to corrode. Simplicity means precision.

RELIABLE OVERLOAD RELAYS
Two eutectic solder relays give dependable overload protection. Accuracy unaffected by age.

AMPLE WIRING SPACE
Cabinets generously proportioned to provide ample space for wiring. No skinned knuckles.

WHITE INTERIOR
Enclosures have white enameled interiors for visibility in dark corners and easy installation.

COMPLETE LINE
The Allen-Bradley line includes all sizes from Size 0 to Size 7 in all NEMA types of enclosures.

When maintenance men, electrical contractors, and plant engineers were asked, in several independent surveys—"What make do you consider *first* when specifying motor controls?"—they consistently said—"We prefer Allen-Bradley." Why? Because Allen-Bradley starters are so simple. There are no gimmicks like pins, pivots, levers, or linkages to gum up and stick. There is no contact maintenance, so you can install Allen-Bradley starters and forget them. Allen-Bradley starters are *first* because they are so trouble free.

Standard Enclosures for Every Type of Service Condition

A-B Quality

ALLEN-BRADLEY

QUALITY

BULLETIN 709 SOLENOID STARTERS

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.

2-52-M

AVAILABLE IN *Three* HANDY FORMS

START-STOP BUTTONS in cover for 2-wire pilot control

WITHOUT BUTTONS in cover for 3- or 2-wire pilot control

3-WAY SELECTOR SWITCH in cover for 3- or 2-wire pilot control

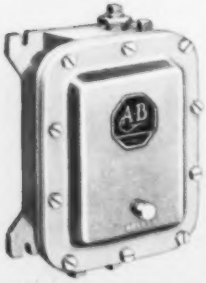
FORM 1 with Start and Stop push buttons for machines where the starter can be located conveniently near the operator.

FORM 2 with plain cover for machines where starter must be operated by remote push buttons or limit switches.

FORM 3 with Hand-Off-Auto 3-way selector switch for air conditioners, pumps, and other automatic machinery.

ALLEN-BRADLEY SOLENOID STARTERS

in Enclosures for Every Type of Industrial Service



Allen-Bradley starters are available in various standard NEMA type enclosures.

Machinery designers who realize the importance of selecting the right enclosure for each application are specifying Form 1 enclosures with Start and Stop push buttons for many machines, thus reducing the installation cost of control wiring. For machines requiring manual as well as automatic control, they use the handy Form 3 enclosure. All starters are available in a variety of NEMA type enclosures to meet any service requirement. For full information, let us send you the Allen-Bradley Handy Catalog.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

A-B Quality

ALLEN-BRADLEY

SOLENOID STARTERS

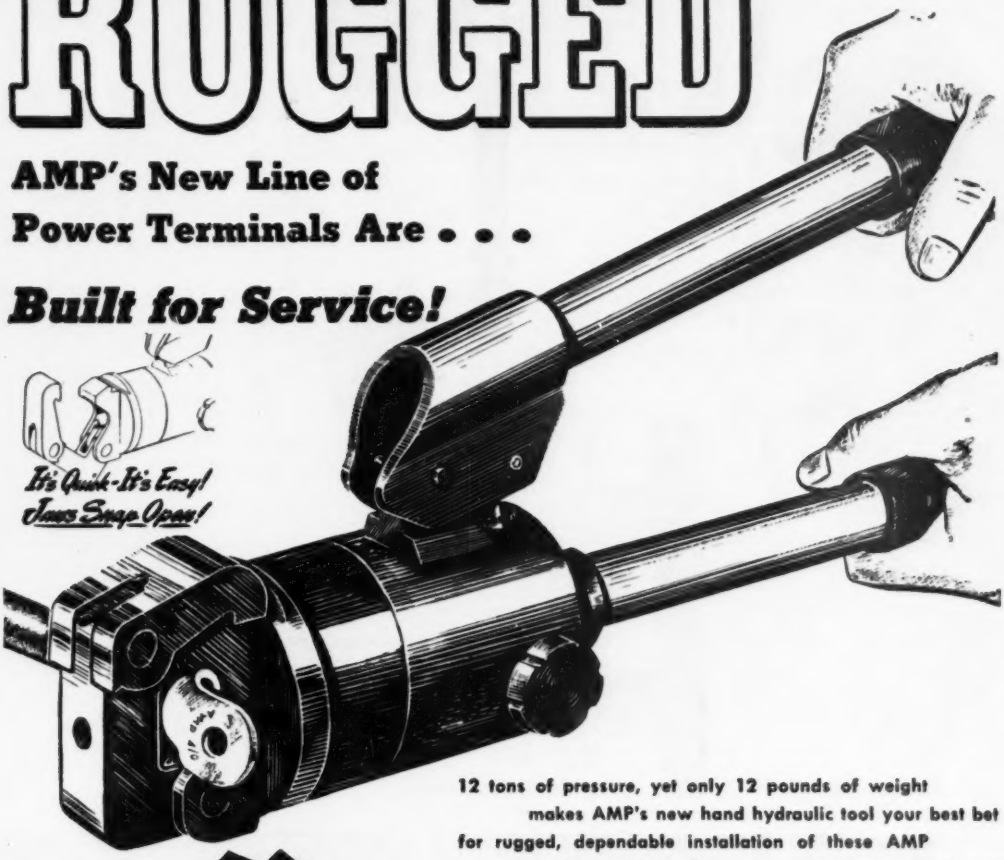
QUALITY

2-52-MR

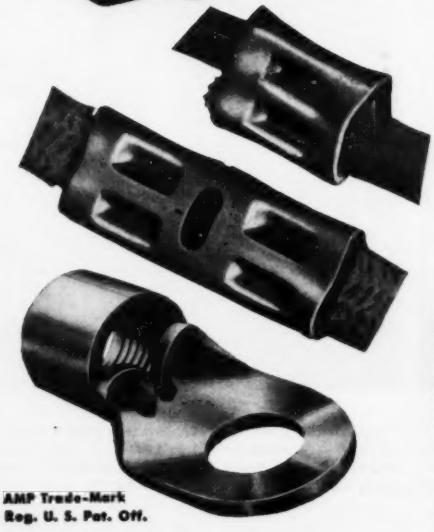
RUGGED

AMP's New Line of Power Terminals Are . . .

Built for Service!



It's Quick-It's Easy!
Jaws Snap Open!

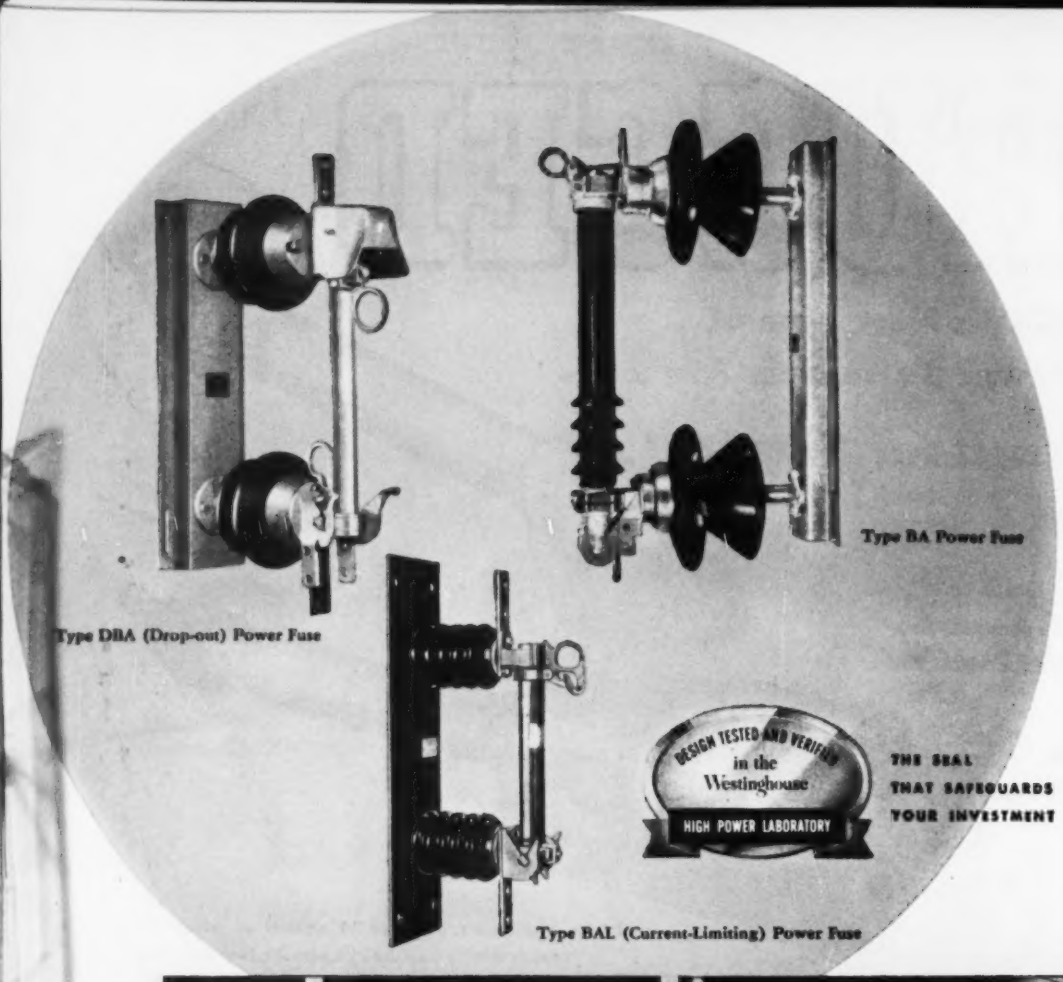


12 tons of pressure, yet only 12 pounds of weight makes AMP's new hand hydraulic tool your best bet for rugged, dependable installation of these AMP *precision-engineered* power terminals. Terminals and connectors are available in all ranges from #8 to #4/0. DESIGNED FOR USE ON ALL SHAPES OF WIRE: SOLID, STRANDED, SQUARE, OVAL, OR COMBINATIONS! Dies snap in and out easily. Tool automatically releases when crimping pressure is reached. Can be used with either pole strap or bench stand if desired. WRITE FOR SPECIAL POWER TERMINAL CATALOG.

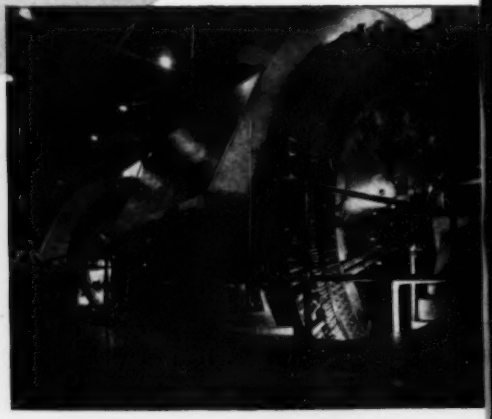
AMP

AIRCRAFT-MARINE PRODUCTS INC.
POWER TERMINAL DIVISION
1200 Paxton Street, Harrisburg, Pa.

AMP Trade-Mark
Reg. U. S. Pat. Off.



In a typical High Power Laboratory test, a Type DBA Fuse is shown interrupting the equivalent of a 3-phase, 1,000,000-kva fault. An instant after the photo was taken, the drop-out element operated, isolating the circuit.



Source of the laboratory's tremendous power are these two 60,000-kva generators. When paralleled, they are capable of delivering a 3-phase fault of 2,500,000 kva, or a single-phase fault equivalent to 4,000,000 kva.

ONLY *CONTROLLED* LABORATORY TESTING CAN PRODUCE THESE RESULTS:

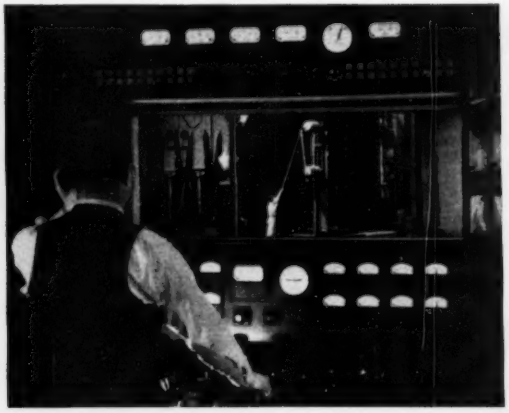
1. Application of Boric Acid Idea to Power Fuses

2. Proved Operation under all Circuit Conditions

In 1931, the Westinghouse High Power Laboratory—already five years old—played a major role in the development of the boric acid fuse. Conducting multiple tests under controlled conditions not available in the field, Westinghouse Laboratory technicians proved conclusively the soundness and superiority of the boric acid interrupting principle. The result is a complete line of low-cost protective devices proved to a degree unattainable by other means of testing. Considering the extent of your investment in fuse-protected equipment, this extra measure of sureness is an invaluable advantage. And it's one you get only when you specify Westinghouse.

Continued High Power Laboratory testing has also widened the application of this economical means of short-circuit protection. From the first Type BA Fuse, low-cost interrupting capacity has advanced with the development of Types DBA (drop-out) and BAL (current-limiting) until now 138,000-volt fuses that interrupt one million kva are available.

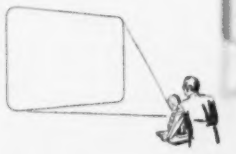
FOR COMPLETE INFORMATION on Westinghouse Power Fuses ask for a copy of Booklet B-5469. Contact your Westinghouse representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60781



From this control desk, a single operator guides all high power testing facilities. The control room also houses indicating instruments, protective relays, sequencing drums, and oscillographs which simultaneously record as many as eighteen variables.

See "Electrical Proving Ground"

...the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse Representative, or write: Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania.



YOU CAN BE SURE...IF IT'S Westinghouse

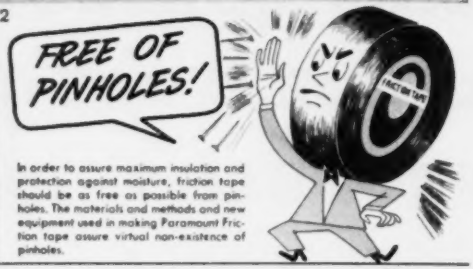
POWER FUSES

PARAMOUNT FRICTION TAPE by Haartz-Mason

1

Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.

2



In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.

3

Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against ravelling.

4

Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.

5

Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212° F. for 16 hours. Thus you get a guarantee of maximum aging ability.

6

Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus . . . guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.

7

To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.

Dual Guarantee on Weight and Length

Manufactured by

Haartz-Mason, Inc.

WATERTOWN 72, MASS.

Business Character
River Leaders of the World Association

L-M's Expanding Anchors

now redesigned to give you

✓ FASTER INSTALLATION!

✓ GREATER HOLDING POWER!

✓ AT NO INCREASE IN PRICE!

Blades closed.

Partly expanded. Spreader arms push blades out easily—no binding.

Fully expanded.

L-M has redesigned its steel expanding anchors to give you easier installation, and greater holding power.

Expanded area is increased 10 to 15%—which means more holding power in any kind of soil.

Spreader arms are heavier and stronger. These improvements, together with a new hinge arrangement, completely eliminate binding. Tamping is much easier, installation is faster.

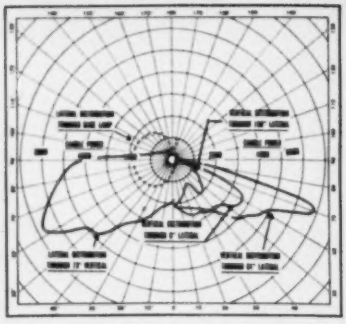
As the tamping block strikes the tamping collar, the strong spreader arms give the steel blades a sliding action that cuts into the surrounding soil quickly and easily.

These anchors are 8" in diameter when fully closed and are available in two-way, three-way, or four-way designs, for ½", ⅝", and ¾" anchor rods.

For complete information on these and other L-M Line Construction Materials, ask the L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL *Line Construction Materials*

Complete Coordinated Equipment for Distribution Today



The L-M *Ovalite* takes either incandescent or horizontal-burning mercury vapor lamps. Mercury lamp is high up in the reflector. This, combined with the design of the HOLOPHANE® refractor, results in low surface brightness and less glare, and a broad light-distribution pattern as shown by the curves in the chart.

New design of L-M Ovalite gives improved light distribution for mercury vapor

The new *Ovalite* is designed for high intensity lighting over a wide area. The rectangular Alzak reflector provides asymmetric light distribution. An Alzak deflector passes the light down around, not through, the lamp. Prisms on the house side of the Holophane refractor re-direct the light toward the street. Optional magnetic arc-control feature holds the arc in the optical center.

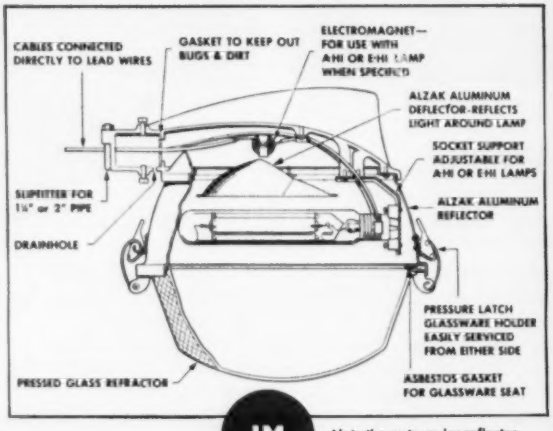
Lower mounting height—Unlike mercury vapor units with narrower distribution, the *Ovalite* provides wide IES type IV distribution. This means that the *Ovalite* is effective at lower mounting heights of 25 to 30 feet, which saves pole costs and maintenance. The use of elevating prisms in the refractor results in low surface brightness and minimum glare.

Unusual easy-service feature—Pressure latches on both sides hold the glassware snugly. Either latch acts as a hinge when the other is opened, permitting service from either side. An exclusive L-M feature.

Pendent or side-mounted, for either mercury or incandescent—The *Ovalite* takes mercury vapor E-H1, 20,000 lumens; A-H1, 15,000 lumens; or A-H5, 11,000 lumens; or incandescent lamps up to 15,000 lumens series. Slipfitter and pendent mountings in 1¼" or 2" sizes.

GET THIS FREE OVALITE BULLETIN

The *Ovalite* bulletin provides details on design, use, types, ballasts. Ask your L-M Field Engineer for a copy or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).


CABLES CONNECTED DIRECTLY TO LEAD WIRES
GASKET TO KEEP OUT BUGS & DIRT
ELECTROMAGNET—FOR USE WITH AH1 OR EH1 LAMP WHEN SPECIFIED
ALZAK ALUMINUM DEFLECTOR-REFLECTS LIGHT AROUND LAMP
SOCKET SUPPORT ADJUSTABLE FOR AH1 OR EH1 LAMPS
SLIPFITTER FOR 1¼" or 2" PIPE
ALZAK ALUMINUM REFLECTOR
DRAINHOLE
PRESSURE LATCH GLASSWARE HOLDER EASILY SERVICED FROM EITHER SIDE
PRESSED GLASS REFRACTOR
ASBESTOS GASKET FOR GLASSWARE SEAT

Note the rectangular reflector, the deflector, and the mounting of lamp well up in the reflector.

82

LINE MATERIAL

Street Lighting

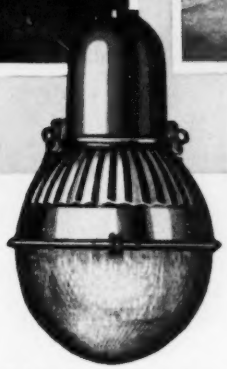
Ovalite is an L-M trademark

For every part of town...

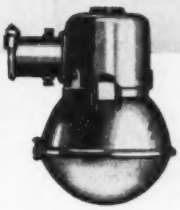
L-M LUMINAIRES

make cities brighter, safer

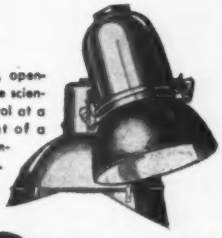
L-M Ovalite—Mercury Vapor Unit. Newly developed optical system assures effective light utilization and good distribution on the street. Mercury vapor lamp is in horizontal position, high up in the reflector to minimize glare. Takes 11,000, 15,000 or 20,000 lumen lamp. Optional magnetic arc control feature keeps arc centered.



L-M Spherolite This famous L-M unit is widely known for its high efficiency, versatility, and many other desirable features. Takes up to 20,000 lumen mercury vapor or 10,000 lumen incandescent lamps.



L-M Spherolite Jr. For better neighborhood lighting at an economical neighborhood price. Interchangeable with Spherolite metal or porcelain heads, permitting low cost installation of the Junior and economical replacement later with the larger luminaire if traffic growth warrants. Has many of the Spherolite features, offers many light distribution patterns.



L-M Directolites Efficient, open-type luminaires that provide scientifically designed light control at a cost little more than that of a radial bowl. Available in symmetric or asymmetric types.

L-M provides complete street lighting equipment for all sizes of communities and all kinds of neighborhoods. There are incandescent or mercury vapor units for white way lighting. There are smaller units for residential and outlying sections. A wide variety of reflectors, deflectors and glassware provides complete control for every recommended IES light distribution pattern.

Also available are standards, brackets and mast arms, transformers, control and service equipment.

L-M street lighting engineers have years of experience and L-M's engineering service can provide the answer to your street lighting application problem.

WHICH OF THESE BULLETINS DO YOU WANT?

- ☐ Spherolite
- ☐ Directolite
- ☐ Mercury Vapor Lighting Units
- ☐ Spherolite Jr.
- ☐ Controlite®
- ☐ Street Lighting Standards
- ☐ Brackets, Mast Arms, Accessories
- ☐ Control Equipment
- ☐ Protective Lighting for industrial plants

Ask the L-M Field Engineer for the information you want, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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Ovalite, Spherolite, and Directolite are trademarks

LM

LINE MATERIAL

Street Lighting

NEW! EXCLUSIVE!
L-M's 7.5 KV "FAMILY"
of cutouts with interchangeable doors!

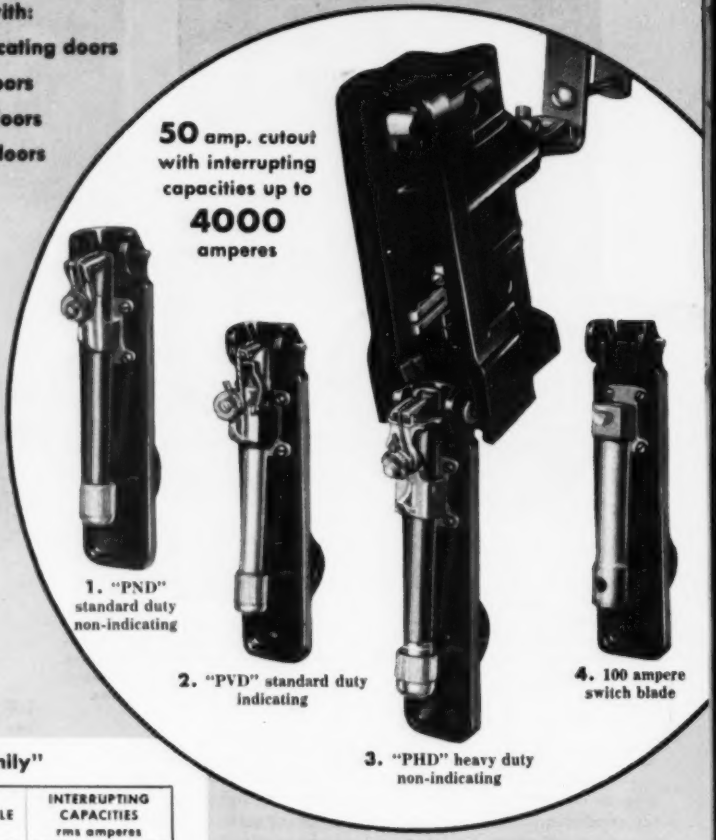
50 and 100 ampere cutouts, each with:
new "PND" standard duty non-indicating doors
"PVD"* standard duty indicating doors
"PHD" heavy duty non-indicating doors
100 and 200 ampere switch blade doors

Here's another L-M "first"! The new 7500-volt family of 50 and 100 ampere cutouts, each with four interchangeable doors to meet a wide variety of services. As operating requirements change, you simply change a door—in 6 seconds the job is done! Saves warehousing, saves installation time, saves in operation.

Safer, too. Doors are removed or hooked on, all with the switch stick. When door is open, all parts are dead.

GET THE WHOLE STORY

Ask the L-M Field Engineer for details on L-M's new "first families" —the 7500-volt family shown here, *and L-M's new 5000-volt family*, also! Or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).


50 amp. cutout with interrupting capacities up to 4000 amperes
1. "PND" standard duty non-indicating
2. "PVD" standard duty indicating
3. "PHD" heavy duty non-indicating
4. 100 ampere switch blade

L-M's new 7.5 kv "Family"

RATING	INTERCHANGEABLE DOORS AVAILABLE	INTERRUPTING CAPACITIES rms amperes
50 AMPERES	1. "PND" standard duty non-indicating	1200 amperes
	2. "PVD" standard duty indicating	1200
	3. "PHD" heavy duty non-indicating	4000
	4. Switch Blade	100 amperes continuous current rating
100 AMPERES	5. "PND" standard duty non-indicating	3000 amperes
	6. "PVD" standard duty indicating	3000
	7. "PHD" heavy duty non-indicating	8000*
	8. Switch Blade	200 amperes continuous current rating

"PND", "PVD", AND "PHD" are L-M Trademarks *Available soon

100 amp. cutout with interrupting capacities up to 8000 amperes

5. "PND" standard duty non-indicating
6. "PVD" standard duty indicating
7. "PHD" heavy duty non-indicating
8. 200 ampere switch blade

LINE MATERIAL
fuse cutouts

Complete Coordinated Equipment for Distribution Today

Now you get DOUBLE holding power

L-M Guy Clamps with TORKOL-Treated Nuts

Work Faster, Easier!

Now you can use *one* guy clamp where you formerly used two! Tests show that with Torkol nut lubricant—an L-M "exclusive"—wrench torque develops twice the normal holding power of an untreated clamp. High strength, heat-treated bolts assure plenty of extra strength.

THESE TESTS TELL THE TORKOL STORY

Recent tests compared the holding power of Torkol-treated 3-bolt clamps with untreated 3-bolt clamps. The pull required to produce ⅛-inch slip of the guy strand was measured for a wide range of wrench-torque values. Results were plotted into comparative "Nut-Torque vs. Holding Power" curves shown at the right.

SEE WHAT A DIFFERENCE!

To hold a pull of 7000 pounds, using ⅜" high strength guy strand and clamps with ⅝" dia. bolts, required the following nut torques:

with *un*treated clamps, 120 foot-pounds torque;

with Torkol-treated clamps, 52 foot-pounds—less than half as much!

The extra holding power of L-M Torkol-treated guy clamps often permits the use of a clamp with smaller bolts. For example: With 3-bolt clamps with ⅝" bolts, on ⅜" HS strand, with 90 foot-pounds of torque:

*un*treated clamp held a 5800-pound pull;

Torkol-treated clamp held 12,400 lbs.

With a 3-bolt clamp with ½" bolts:

*un*treated clamp held a 3800-pound pull;

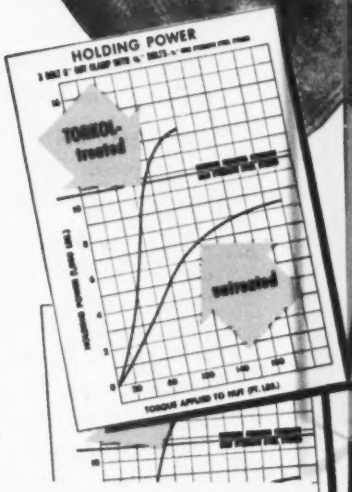
Torkol-treated clamp held 9700 pounds.

The Torkol-treated clamp with ½" bolts held 3900 pounds more than the untreated clamp with ⅝" bolts! The possible savings are obvious.

SERVES YOU BETTER—COSTS NO MORE

With L-M Guy Clamps, you save on material, cut installation time, and get far better strength-balance in the whole guying installation. What's more, Torkol-treated L-M clamps contribute to worker-safety, for they seldom require heavy muscular effort with its risks of straining and danger. *And L-M Torkol-treated clamps cost you no more!*

Torkol is a Line Material Trademark



GET THESE NEW FACTS ON "TORKOL"

Want a complete set of these new Torkol test curves? Eight charts cover the guy-strand range from ¼" to ⅜"—and permit coordination of guy clamp holding strength with that of other components. Ask your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

L-M Guy Clamps are made in styles from one to four bolts, of heavily galvanized steel. Smooth grooves with rounded edges prevent strand damage. The high-strength bolts may be inserted from either side.

All nuts are Torkol-treated—identified by their yellowish color. They go on quickly, stay tight, unscrew easily, may be reused. Clean. Dry. Unaffected by weather or weather changes.

LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today

How to the Efficiency Boiler-Room

Before you get steam you've got to spend dollars—so dollars are a form of energy.

And if your boiler-room dollars are invested in equipment that isn't working efficiently, economically, your "investment" is poor.

That's where co-ordinated controls by Bailey can help. Here's why they'll increase your "boiler-room investment efficiency":

1. **Complete Range of Equipment—fully co-ordinated.** You need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment, just because he has a limited line to sell—or that Bailey will pass the buck for efficient control; we offer *complete* boiler control systems.

2. **Engineering Service—backed by experience.** No other manufacturer of instruments and controls can offer as broad an experience, based on successful installations involving all types of combustion, flow measurement and automatic control.

3. **Direct Sales-Service—conveniently located near you.** Bailey Meter Company's sales-service engineers are located in more industrial centers than those of any other manufacturer of boiler control systems; you get prompt, experienced service with a minimum of travel time and expense.

•

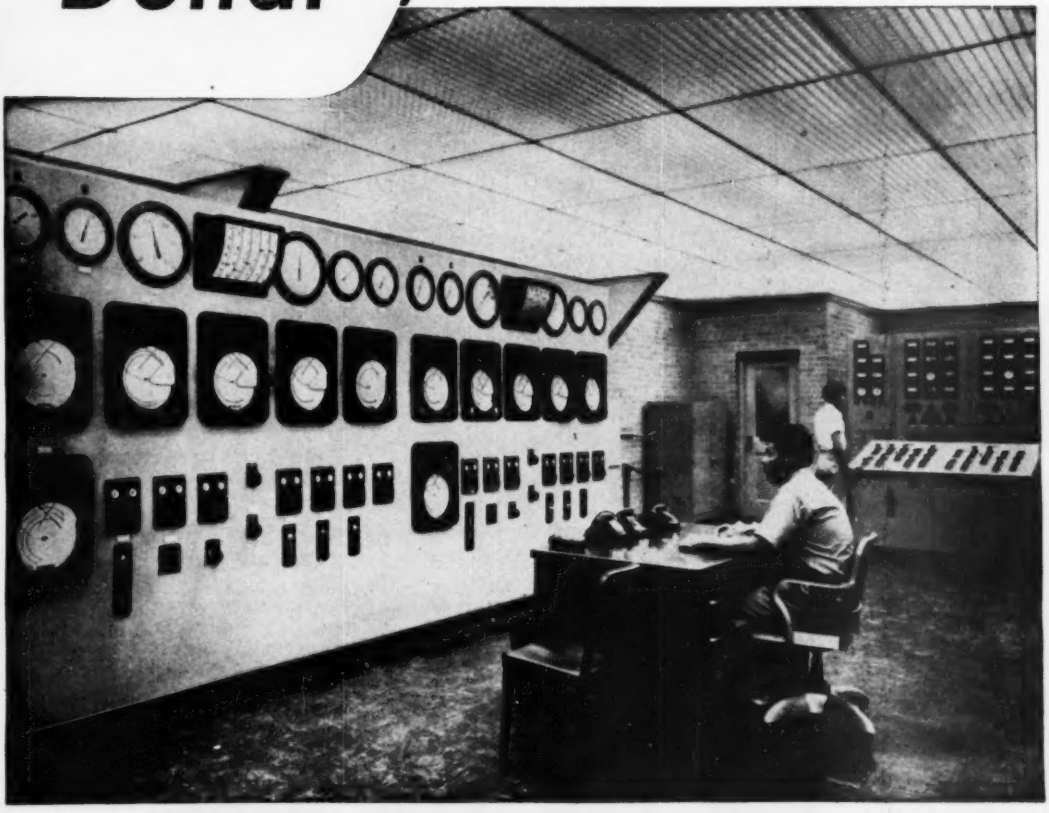
For better "boiler-room investment" efficiency—for more power per fuel dollar, less outage and safer working conditions, you owe it to yourself to investigate Bailey Controls. Ask a Bailey engineer to arrange a visit to a nearby Bailey installation. We're proud to stand on our record: "More power to you!"

111-1

Controls for Steam Plants

COMBUSTION • PRESSURE
FEED WATER • LIQUID LEVEL
TEMPERATURE • FEED PUMPS

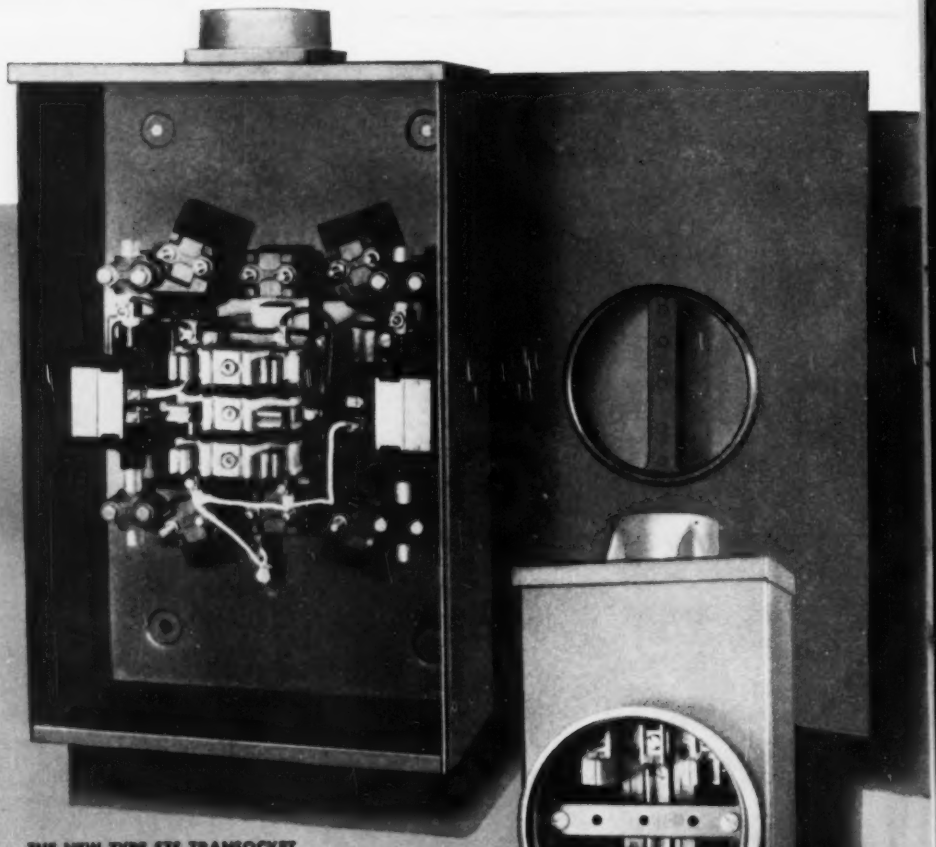
INCREASE of YOUR Dollar



These Bailey Boiler Controls for Combustion, Feed Water, and Steam Temperature insure efficient operation of two 450,000 lb per hr, 1000 psi, 900 F, gas and oil fired boilers.

BAILEY METER COMPANY

1060 IVANHOE ROAD • CLEVELAND 10, OHIO
BAILEY METER COMPANY, LIMITED • MONTREAL, CANADA



THE NEW TYPE STS TRANSOCKET

- Contains integral transformers
- Handles heavy loads—up to 400 amperes
- Cuts installation costs
- Compact design—saves space

THE TYPE STU, HEAVY-DUTY METER SOCKET

- Takes standard S-type meters
- Takes up to No. 0000 cable
- Utilizes full inherent capacity of 30-amp meters
- Has removable jaws and terminal assembly
- Compact design—saves space
- Fully automatic circuit closing device

THERE'S A WESTINGHOUSE METER FOR EVERY APPLICATION!

Single-phase watthour meter

Combination polyphase watthour and thermal demand meter

Combination single-phase watthour and thermal demand meter

Polyphase meter with block interval demand register

Two New Ways
to cut metering costs on heavy loads

Here's a pair of Westinghouse "firsts" designed specifically to cut your metering costs—the STU High Capacity Socket and the new STS Transocket, with integral transformer.

Both sockets are ideal for heavy current applications where it was formerly necessary to devise special metering facilities. They install easily . . . inexpensively . . . and take standard meters. For electric house heating, outdoor pumping installations and many large commercial loads, their cost-cutting characteristics promise important new savings. And these new units are only part of . . .

A complete line of metering equipment . . . one that meets all of your present needs . . . and anticipates many of your future requirements!

In the complete line of Westinghouse Metering Equipment you'll find many opportunities for savings. So whether your needs involve metering large loads or small, single or polyphase circuits, kw or kva, Westinghouse is a good place to go.

For complete information on High Capacity Sockets, write for Bulletin CS-42-810. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-40396

YOU CAN BE SURE... IF IT'S Westinghouse

METERS

WEST-COAST UTILITY *reports:*

TROUBLE-FREE SERVICE

FROM ITS C-D CAPACITOR INSTALLATIONS
TOTALLING OVER 155,250 KVAR

Here's another verified C-D field performance record. A large western utility ordered its first C-D capacitors for power-factor improvement back in 1938, and followed this up with many additional C-D installations, totalling over 155,250 Kvar. This utility now reports that these C-D units have given trouble-free service in the field, year after year, with little or no maintenance required. A real tribute to the rugged, money-saving dependability of C-D capacitors!

HERE'S HOW DEPENDABLE SERVICE IS BUILT INTO C-D CAPACITORS:

- Lowest dielectric unit stress
- Highest major insulation level
- Case SAND-BLASTED before spraying, for longer-lasting finish
- Dykanol-filled bushing increases accepted flash-over safety factor
- Lowest volt-amperes per square inch of radiating surface
- Removable solderless connectors
- Many small sections; extremely low voltage gradient per section
- Impregnated and submerged in non-inflammable, non-explosive Dykanol. Results in lower unit weight per Kvar; high stability and longer life

A C-D field engineer will be glad to discuss your power-factor capacitor requirements. Write today for catalog of C-D industrial, station and pole-type capacitors. Cornell-Dubilier Electric Corp., Dept. D-42A South Plainfield, N. J.

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO

Installed over 18 years ago on this bridge, Transite Conduit is still on the job despite the attack of corrosive fumes, weather, and vibration.

Resists the Elements: Transite Ducts are standing up far longer than other materials on this cooling-tower wall despite corrosive conditions. Transite's exceptional corrosion-resistance practically eliminates maintenance and replacement costs through the years.

Outlasts other Materials: When other ducts failed to stand up under the streets of a city in the Far West, Transite Ducts were installed. Their life expectancy is far greater than that of the ducts they have replaced.

That's why TRANSITE® DUCTS stay on the job despite corrosive fumes, soils and weather

If you're looking for a conduit that will stand up for years in tough service . . . use Transite Ducts that not only resist corrosion but are immune to electrolysis, too.

Transite, you see, is made of asbestos and cement . . . two naturally corrosion-resistant materials. It stands up in corrosive cinder fills, salt marshes, and other troublesome soils. It also withstands the attack of smoke, fumes . . . and weather conditions will not shorten its service life. Since it is inorganic and nonmetallic, Transite also is immune to electrolysis or galvanic action.

You will find that Transite Ducts save you money on your cableway system not only by staying on the job longer . . . but by holding down the initial cost, too. For further information write Johns-Manville, Box 290, New York 16, N. Y.

4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. Incombustible. Transite will not burn or contribute to formation of smoke, gases, or fumes. It confines burnouts and protects adjacent cables.

2. Permanently Smooth Bore. Transite makes long cable pulls easy. Danger of damage to cables is also minimized.

3. Easy To Install. Transite Ducts are light weight, easy to handle. Joints are quickly made. And, long 10-foot lengths reduce the number of joints in the line.

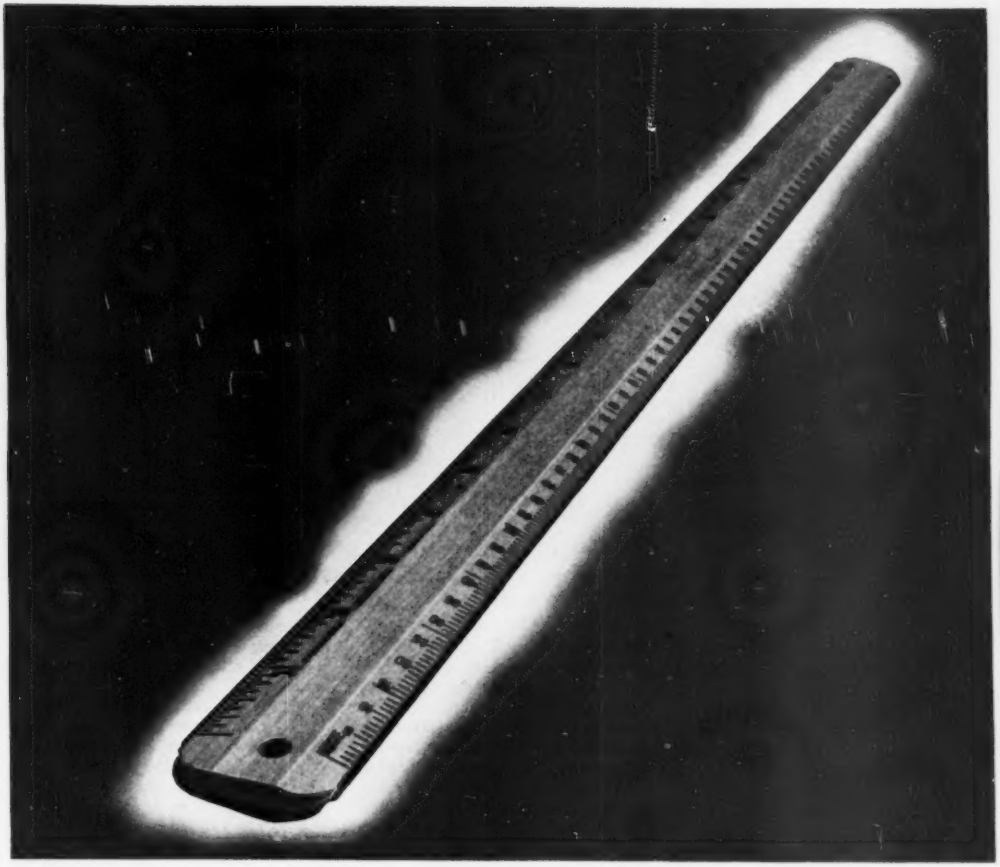
4. Higher Thermal Conductivity. Cables run cooler in Transite Ducts, reducing I^2R losses, increasing current capacity, and prolonging insulation life.

Johns-Manville TRANSITE DUCTS

JM PRODUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement



Measures Up...

YOU CAN TAKE IT as a rule that commercial cooking always measures up to the utility yardstick for good, profitable performance.

Here's why . . .

. . . *Good Load Factor—30% on the average, with much of it during off-peak hours!*

. . . *High Diversity—rarely exceeding 40-50% of the total connected load!*

. . . *100% Power Factor!*

. . . *Good Voltage Regulation—no instantaneous peaks or load surges!*

Together these advantages make commercial cooking a top earning load for utilities (13% return on each dollar invested) at minimum cost to serve.

Hotpoint *can* and will show you how you can get a line on this load builder . . . quickly, easily!

Won't you write me a letter expressing your interest?

Just address it to: Orrin E. Wolf, Vice President, Hotpoint Inc. —Commercial Equipment Department—265 So. Seeley Avenue, Chicago 12, Illinois.

Hotpoint

Hotpoint Inc., A General Electric Affiliate

FIRST IN COMMERCIAL COOKING
. . . the load builder to get a line on!

5 kv outdoor metal-clad switchgear in MCS unit substation with DZ 60 B oil circuit breakers rated 150 mva installed at an east coast utility.

WHEN INDOOR space becomes limited — go OUTDOORS where there's lots of room for future expansion. You save valuable indoor space for other equipment, eliminate expensive building additions or changes.

For outdoor service be sure the switchgear you select is completely steel enclosed to assure reliable operation in any weather—sleet, snow, rain, subzero temperatures and intense heat.

Allis-Chalmers Switchgear is All-Weather Protected: (1) welded-in steel floor plates form a tight bottom seal; (2) overhanging eaves keep out driving rain and sleet; (3) weather proof doors, 3-point latched, close firmly; (4) steel surfaces are phosphate treated prior to receiving multiple coats of weather-tested paint that makes them corrosion and weather resistant; (5) structure rests on 6" base channels; (6) ice and sleet guards protect locks; (7) copper mesh filters furnish protected ventilation.

Allis-Chalmers 5 kv and 15 kv outdoor switchgear is available in ratings from 600 to 2000 amperes, 50,000 to 500,000 kva interrupting capacities. Consult your nearest A-C sales office.

Allis-Chalmers
Milwaukee 1, Wis.

ALLIS-CHALMERS

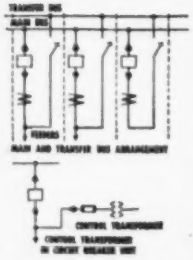
A-3686

VARIED CIRCUIT ARRANGEMENTS

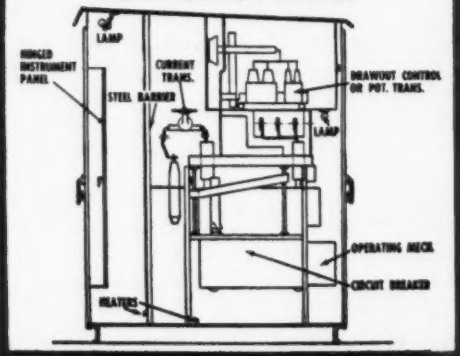
Unique compartment design permits many circuit arrangements in a standard breaker unit. Two typical arrangements are shown:

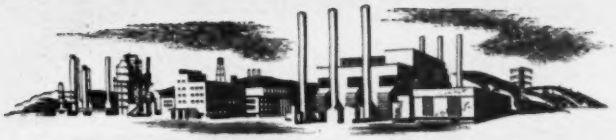
1. Double bus arrangement with transfer bus and disconnect switch above the main bus compartment. All equipment is easy to get to without extra provisions.

2. Control power transformer arrangement that eliminates the need for an extra auxiliary compartment. Generally used for secondary control battery charging and to supply power for space heaters and lighting applications.



CONSTRUCTION DETAILS





CLIENT CONFIDENCE

NOW AND IN THE RECENT PAST we have been privileged to serve as Engineers-Constructors for a distinguished group of clients, INCLUDING:

IN THE UNITED STATES & CANADA

BETHLEHEM PACIFIC COAST STEEL CORPORATION
CALIFORNIA RESEARCH & DEVELOPMENT COMPANY
COLUMBIA STEEL COMPANY
CONTINENTAL CAN COMPANY, INC.
CONTINENTAL OIL COMPANY
FOOD MACHINERY AND CHEMICAL CORPORATION
GENERAL MILLS, INC.
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GULF OIL CORPORATION
HAWAIIAN ELECTRIC COMPANY
HERCULES POWDER COMPANY
HILLS BROS. COFFEE, INC.
HILO ELECTRIC LIGHT COMPANY, LTD.
INTERPROVINCIAL PIPE LINE COMPANY
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THE OHIO OIL CO.
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PACIFIC ELECTRIC MANUFACTURING CORPORATION
PACIFIC GAS AND ELECTRIC COMPANY
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SALT LAKE PIPE LINE COMPANY
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TENNESSEE GAS TRANSMISSION COMPANY
TEXAS ILLINOIS NATURAL GAS PIPELINE COMPANY
TIDE WATER ASSOCIATED OIL COMPANY
TRANS MOUNTAIN OIL PIPE LINE COMPANY
UNION OIL COMPANY OF CALIFORNIA
UNITED STATES RUBBER COMPANY
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THE KINGDOM OF SAUDI ARABIA
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IRAQ PETROLEUM COMPANY, LIMITED
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BECHTEL CORPORATION

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ASSOCIATE COMPANIES: ARABIAN BECHTEL COMPANY • BECHTEL INTERNATIONAL CORPORATION
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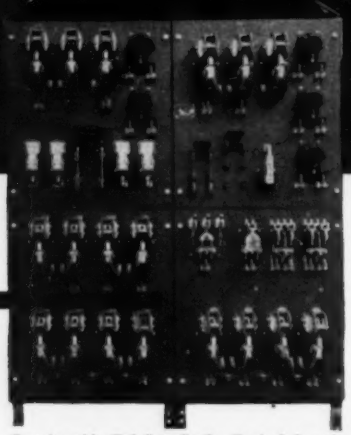
MIDDLE EAST BECHTEL CORPORATION

This control panel has 3 hidden strengths . . .



Control panel by Clark Controller Co., Cleveland, O., made of K&M Ebonized Asbestos, with arc shields of K&M White Cold-Molded Asbestos.

It's made with K&M EBONIZED ASBESTOS—

Sure, it's handsome, neat, and looks efficient. But you'll find that apart from the satin black finish of the K&M Ebonized Asbestos, this panel's real strengths are hidden. To wit—

1. *IT'S HIGHLY DIELECTRIC . . . for when asbestos fibers and binding cement are molded under pressure and impregnated with a special insulating compound, the result is a non-magnetic product and with an exceptionally high dielectric strength.*

2. *VIBRATION-PROOF . . . your breaker components stay put when they're anchored on K&M Ebonized Asbestos—a material that ignores shock, vibration, and temperature changes.*

3. *ROCK-LIKE STRENGTH . . . your panel is relatively lightweight and compact, but enormously strong because the asbestos and cement of which it is made are practically indestructible.*

You get other advantages, too, with K&M Ebonized Asbestos . . . *it's easy to work*—can be cut and drilled without chipping or fracture—*it's versatile*—comes in $\frac{1}{8}$" to 4" thicknesses suitable for switchboards, bus bar supports, compartment linings, testing tables and the like.

Write us for details on any application—we'll rush a reply.

Nature made Asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

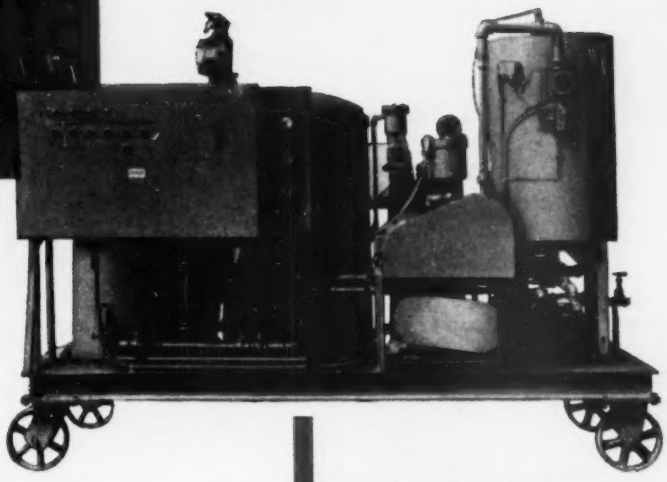
K&M Spell it asbestos

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA
In Canada: ATLAS ASBESTOS CO., LTD., MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Houdaille Purivac

Insulating Oil Purifier

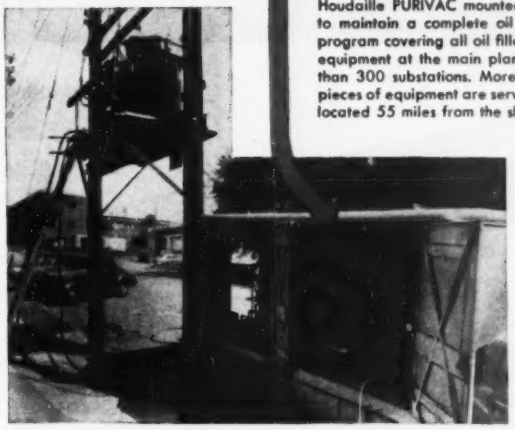
ONLY



1. Performs complete purification, dehydration and degasification. No blotter press required.
2. Performs equally well in the field or at a central station. Low operating cost.
3. No service interruptions. Purifies oil while transformers, circuit breakers, etc., are in operation.
4. Automatic, interlocking safety controls insure complete protection.

A regular program of PURIVAC oil purification reduces power failures and equipment damage caused by deteriorated oil. Utilities and power plants have proved that PURIVAC preventive maintenance prolongs the useful life of oil . . . eliminates costly transformer cleaning operations . . . restores color, neutralization number and dielectric strength of oil.

Only HOUDAILLE PURIVAC gives you this complete oil purification service. Write today for special bulletins giving complete information, specifications, case histories, laboratory reports, etc.



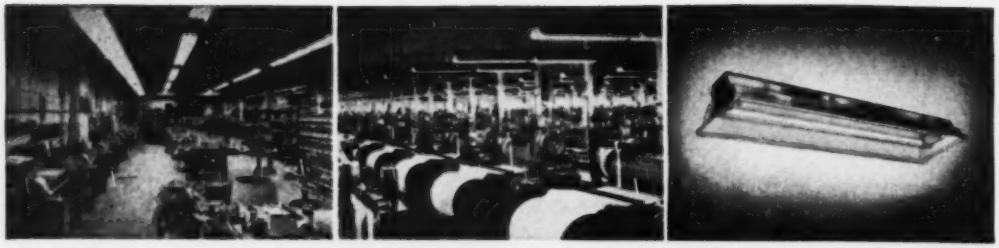
Omaha Public Power District employs a Houdaille PURIVAC mounted in a truck to maintain a complete oil purification program covering all oil filled electrical equipment at the main plant and more than 300 substations. More than 1200 pieces of equipment are served . . . some located 55 miles from the shop.

WORLD'S LEADING OIL FILTER MANUFACTURER

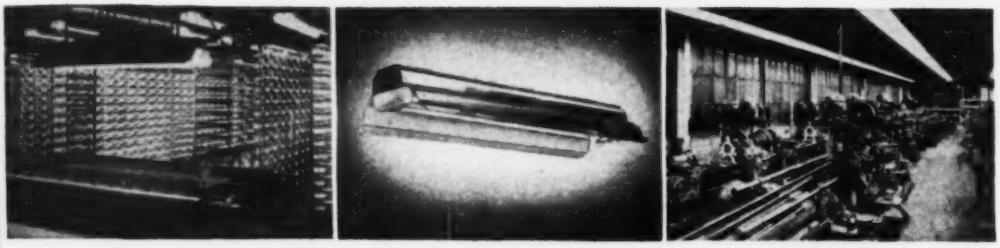
HONAN-CRANE CORP.
819 WABASH AVENUE, LEBANON, INDIANA
A Subsidiary of
HOUDAILLE-HERSHEY CORP.

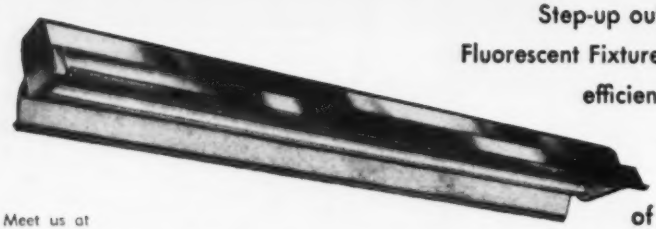
In Canada:
E. W. PLAYFORD, LTD., Montreal 28
W. E. MICKLETHWAITE, Toronto 18
CUMMINGS GALBRAITH, LTD, Edmonton, Alta.

Wheeler lights the way



...to INCREASED DEFENSE PRODUCTION!





Step-up output with *specialized* Wheeler Fluorescent Fixtures! Their greater lighting efficiency pays off in higher quality . . . *increased production* — on every job, in every type of plant condition. And Wheeler engineering means ease of installation and proven maintenance savings. Write Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.

Meet us at
the Cleveland Lighting Exposition
May 6 thru May 9, Booths 209—210.

Wheeler REFLECTORS

WHEELER

Distributed Exclusively Through Electrical Wholesalers

MADE BY SPECIALISTS IN "SKILLED LIGHTING" EQUIPMENT SINCE 1881

SPECIFY wire that ignores heat and cold specify jacketing of...

Vinylite BRAND PLASTICS

Give your wire the upper hand—be sure your cables are jacketed with VINYLITE Brand Plastic over polyethylene cores! These better-than-ever compounds keep their useful properties over a wide range of temperature fluctuation. Formulated to resist heat up to 185° F., they remain flexible and easy to handle down to a −67°F.

Both VINYLITE Plastic and BAKELITE polyethylene retain their electrical qualities under wet weather conditions. BAKELITE polyethylene offers extremely low loss dielectric qualities. You can depend on them for high resistance to water, oils, greases, alkalies and most strong acids. They resist flame, sunlight, aging and mildew. Their smaller dimensions save space. Installation is faster because their smooth surfaces strip and splice so easily.

Discover more about the usefulness of VINYLITE Plastics as jacketing. See how they can improve your operation whether military or civilian. Write for detailed information and a repesentative list of suppliers. Address Department MV-28.

TRADE MARK

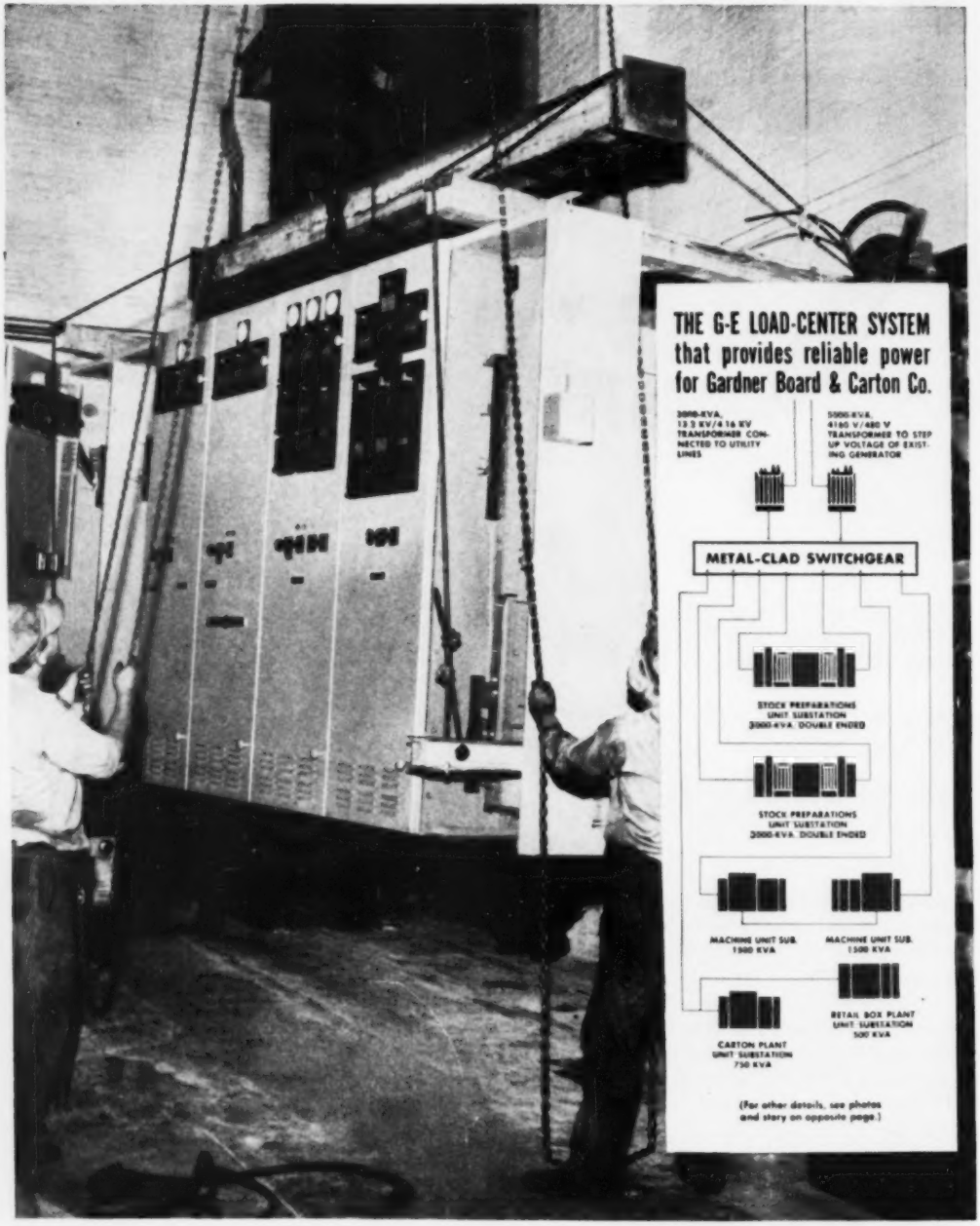
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N.Y.

Memo to Wire Manufacturers

Two important wiring developments are explored in new Bakelite releases. **Kabelitems No. 58,** "Cable Sheath Problems and Designs," describes successful applications of BAKELITE polyethylene insulation in control and communication cable.

Kabelitems No. 48 is a complete report on BAKELITE polyethylene line wire. Send for your copies today!

Ohio plant avoids shutdowns with


THE G-E LOAD-CENTER SYSTEM
that provides reliable power
for Gardner Board & Carton Co.
3000-KVA. 13.2 KV/4.16 KV TRANSFORMER CONNECTED TO UTILITY LINES
5000-KVA. 4160 V/480 V TRANSFORMER TO STEP UP VOLTAGE OF EXISTING GENERATOR
METAL-CLAD SWITCHGEAR
STOCK PREPARATIONS UNIT SUBSTATION 2000-KVA. DOUBLE ENDED
STOCK PREPARATIONS UNIT SUBSTATION 2000-KVA. DOUBLE ENDED
MACHINE UNIT SUB. 1500 KVA
MACHINE UNIT SUB. 1500 KVA
RETAIL BOX PLANT UNIT SUBSTATION 500 KVA
CARTON PLANT UNIT SUBSTATION 750 KVA
(For other details, see photos and story on opposite page.)

G-E FACTORY-ASSEMBLED POWER EQUIPMENT IS EASY TO INSTALL. HERE MEN LOWER MAIN SWITCHGEAR SECTION INTO PLACE.

G-E load-center power system

Like many other growing plants, the Gardner Board and Carton Co. found they needed more power. They realized, too, a pressing need for more protection against power-failure shutdown than they had with their old-type 480-volt distribution system.

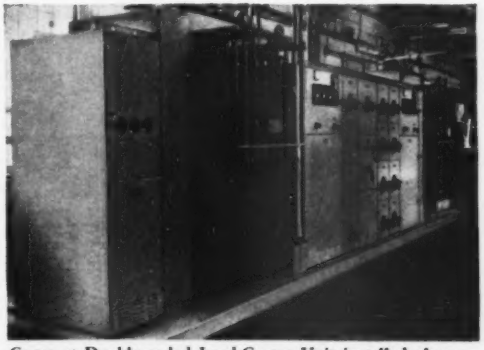
How they did it: With the help of General Electric engineers, Gardner completely replaced their old 480-volt system with a modern 4160-volt G-E load-center system. Compact, metal-enclosed unit substations now give them plenty of power—and plenty of protection against power shutdowns too. A secondary-selective system provides duplicate sources of power for substations supplying the most vital plant loads. Metal-enclosure of all live parts—and modern breakers with plenty of interrupting capacity—give further protection both for production and for plant personnel.

Improves Voltage—Saves Copper—Flexible for Future By taking high-voltage power directly to load centers, long secondary circuits are avoided, and plant voltage improved. The tons of extra copper that would have been required to expand the old 480-volt system were saved. And the plant electric system now has great flexibility for the future. Additional substations can be added easily, quickly, economically. Existing ones can be easily moved to follow load shifts.

For further information on G-E engineered load centers, call on your local G-E sales representative, or write for GEA-3592, General Electric Company, Schenectady 5, N. Y.

G-E "Project Co-ordination" praised by Chief Engineer

"Many costly man-hours were saved for us by G-E over-all co-ordination," says Arthur Harvey, Chief Engineer of Gardner Board and Carton Co. "From planning to final installation, G.E. co-ordinated all equipment and delivery details whereas Gardner men installed the equipment. The effect on our production during this period was negligible." In photo above, Mr. Harvey discusses over-all plan submitted by General Electric with Mr. J. M. Popp, G-E sales engineer. A simple outline of this plan is shown in chart on opposite page.



Compact Double-ended Load-Center Unit installed close to load. Ratings: 3000 kva, 4160/480 v. Drawout breakers are easy to inspect, have plenty of interrupting capacity. Note G-E "Interlocked Armor" cables, which provide metal-enclosed circuits with lower material and installation costs.

GENERAL ELECTRIC

322-78

BITUMINOUS

Power source that needs no pampering

One of the outstanding advantages of Bituminous is its *storability*. This dynamic, low-cost fuel can be stockpiled anywhere—in any volume. Construction of storage facilities is not required when fuel needs increase.

Add to this the *excellence* of Bituminous mined along the Baltimore & Ohio, the wide *variety* available, and its *accessibility* through convenient transportation to industrial centers—and you have ample reason for choosing B&O coals. For helpful advice, *ask our man!*

BITUMINOUS COALS
FOR EVERY PURPOSE

BALTIMORE & OHIO RAILROAD

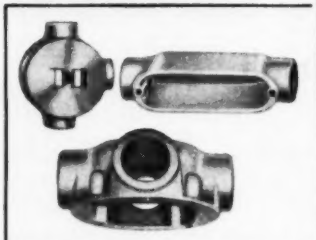
Constantly *doing things* — **better!**

Electrical Applications of Aluminum

Stronger Splices and Deadends

Splices and deadends fabricated from aluminum tubing have proved highly successful for withstanding high pressures and heavy loads in widespread field applications. In addition to meeting the rigid strength requirements, aluminum is meeting with high favor in these electrical uses because of its corrosion resistant qualities, its workability before heat treating and its low cost. Thus aluminum has proved thoroughly satisfactory in both serviceability and in production economies. Snub-type deadends for *ACSR*, hot line clamps, tap clamps and split bolt type connectors are similar electrical applications that utilize the benefits of aluminum sheet, tubing, castings and extrusions.

Efficient Electrical Fittings and Fixtures



Many thousands of different types, sizes and shapes of die-cast aluminum electrical fittings and fixtures are in wide use today. One important reason for this popularity of aluminum is its weight. Aluminum fittings are light, easy to handle and costs less to ship and deliver to the job . . . yet are strong enough to withstand shock and strain far beyond actual job requirements. Aluminum is also rustproof and weatherproof and is highly resistant to chemical corrosion. The smooth satin finish inside and out of aluminum fittings protects fingers during installation and protects insulation on wire. Perfect uniformity in die-cast fittings and fixtures is easily obtained which makes installation easier, cuts costs and speeds up work. Write to Reynolds for details on these and any other electrical aluminum applications.

Make Important
OFFICE SAVINGS
FIELD SAVINGS
with Reynolds ACSR

Your *first* saving comes when you put through a Purchase Order for Reynolds ACSR. You'll find the original cost of this steel reinforced aluminum cable considerably less than other types of cable.

Saving number *two* comes in lower handling costs —ACSR's light weight slices dollars off freight car-to-storage-to-job-site charges.

Lower field costs give you saving number *three*. ACSR is faster, easier to string. ACSR is light yet strong—you can go to longer distances between poles—save up to four poles per mile. Or, because there is less sag to ACSR—you can use shorter poles or towers.

Figure out *your* potential savings. Then take advantage of them and specify Reynolds ACSR. Sooner or later you'll use aluminum—why not now? *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.*

FREE . . . ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

NOW . . . 4 Reynolds Master Reels do the work of 100 wooden reels! Handle ACSR quicker and more economically. Eliminate reel inventory and exchange. Cut down on handling, storing, record-keeping as well as reducing damage cost to a minimum. Reynolds Master Reels and Coils are easily assembled by linemen right on the job . . . are sturdier than wooden reels.

For complete information

see your Reynolds distributors listed below or write direct to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.

Westinghouse Electric Supply Co., New York, New York (And branches) • North Coast Electric Co., Seattle, Washington • Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

REYNOLDS ALUMINUM

Our record of dependability speaks for itself

Power-line companies that use Bell System Communications have dependable service. Continuous preventive maintenance, backed by 75 years experience in the communications business, insures that dependability.

On the rare occasions when there is interruption, trained and experienced men move in quickly to restore service. Our nationwide network of circuits also enables us to change quickly to alternate routes in cases of emergency.

We offer a wide variety of services, using cable, radio and wire. This enables us to fit communications to your individual requirements.

You are interested in good, dependable communications. The record shows we can provide just that.

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

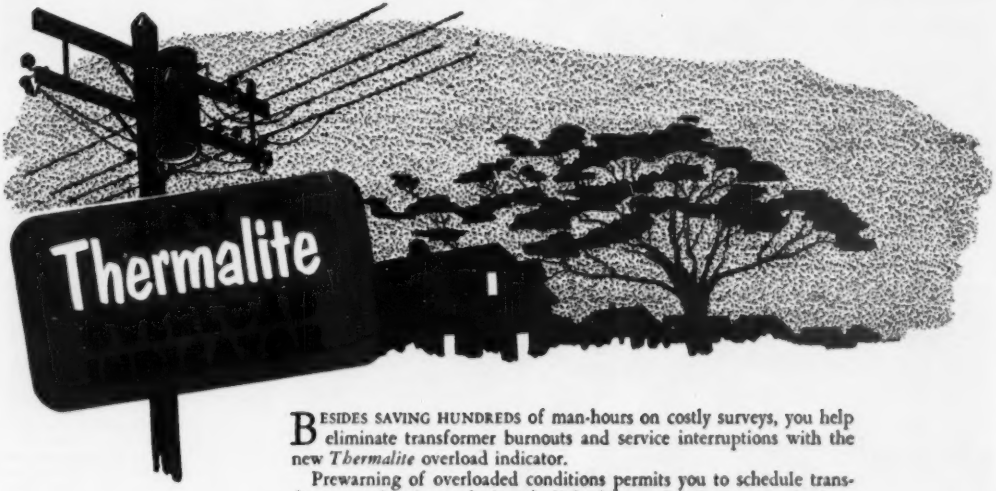
MOBILE TELEPHONE

METERING CHANNELS

BELL TELEPHONE SYSTEM

Here's the Low Cost Way

TO DETECT TRANSFORMER OVERLOADS



Time Saving Visual Check of Transformers with Thermalite Device Offers Permanent, Continuous and Inexpensive Load Check

BESIDES SAVING HUNDREDS of man-hours on costly surveys, you help eliminate transformer burnouts and service interruptions with the new *Thermalite* overload indicator.

Prewarning of overloaded conditions permits you to schedule transformer replacements during daylight hours. But in no case is there interruption of power service . . . because the *Thermalite* indicator operates purely as a signal device. It provides quick warning that the transformer should be replaced with a larger transformer or the load rearranged at the earliest convenient time.

Quiet in operation and simple in construction, the low cost *Thermalite* indicator is recommended for systems where more expensive devices are not feasible.

NOTE THESE IMPORTANT ADVANTAGES

1. The red warning light is actuated by a thermostatic element in the top oil. Light remains on until reset by convenient handle.

2. The device is engineered, calibrated and installed at the factory. It costs virtually nothing to maintain and it is dependable in operation.

3. It operates in all types of weather and is well protected from the elements. The brilliant light permits you to check overloading conditions visually from your service truck.

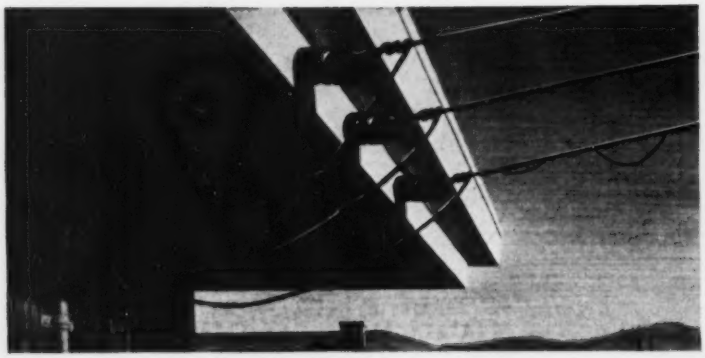
For more information contact your A-C sales office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3692

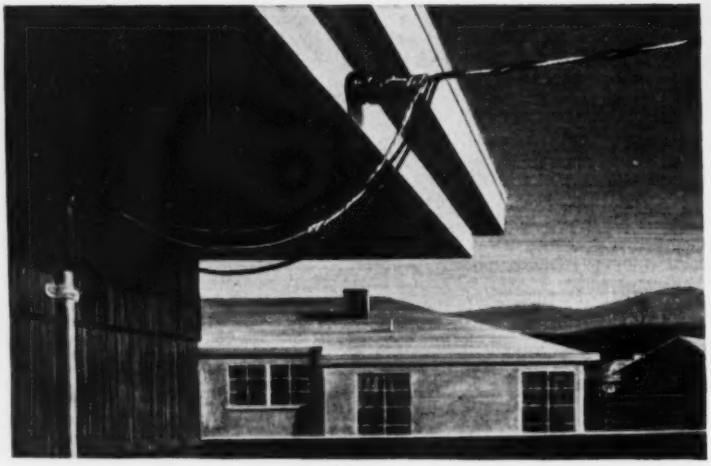
Thermalite is an Allis-Chalmers trademark.

ALLIS-CHALMERS

The Allis-Chalmers overload indicator is available on distribution transformers 100 kva and smaller, 15 kv and lower.



WHY THREE?...



WHEN ONE IS BETTER!

Kaiser Aluminum triplex service drop cable combines *three* wires in a single cable.

Thus you get all these advantages:

Cost savings—compared with copper weatherproof installations—of *20 to 30 per cent!* The reasons: Triplex needs fewer accessories—requires only one house knob. Permits longer spans—cuts maintenance—because light weight and low wind and ice loadings reduce tension on house and pole. And it's installed easier, faster.

What's more, the single cable gives greater clearances, reduces contacts with trees, results in a far neater appearance.

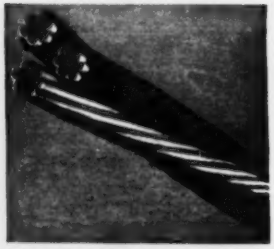
Call us today for the facts! 65 Kaiser Aluminum offices and warehouse distributors in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif.

Also distributed by: General Electric Supply Corporation, Line Material Company, Mine & Smelter Company, Tafel Electric and Supply Company, Westinghouse Electric Supply Company.

Kaiser Aluminum

Setting the pace . . . through quality and service

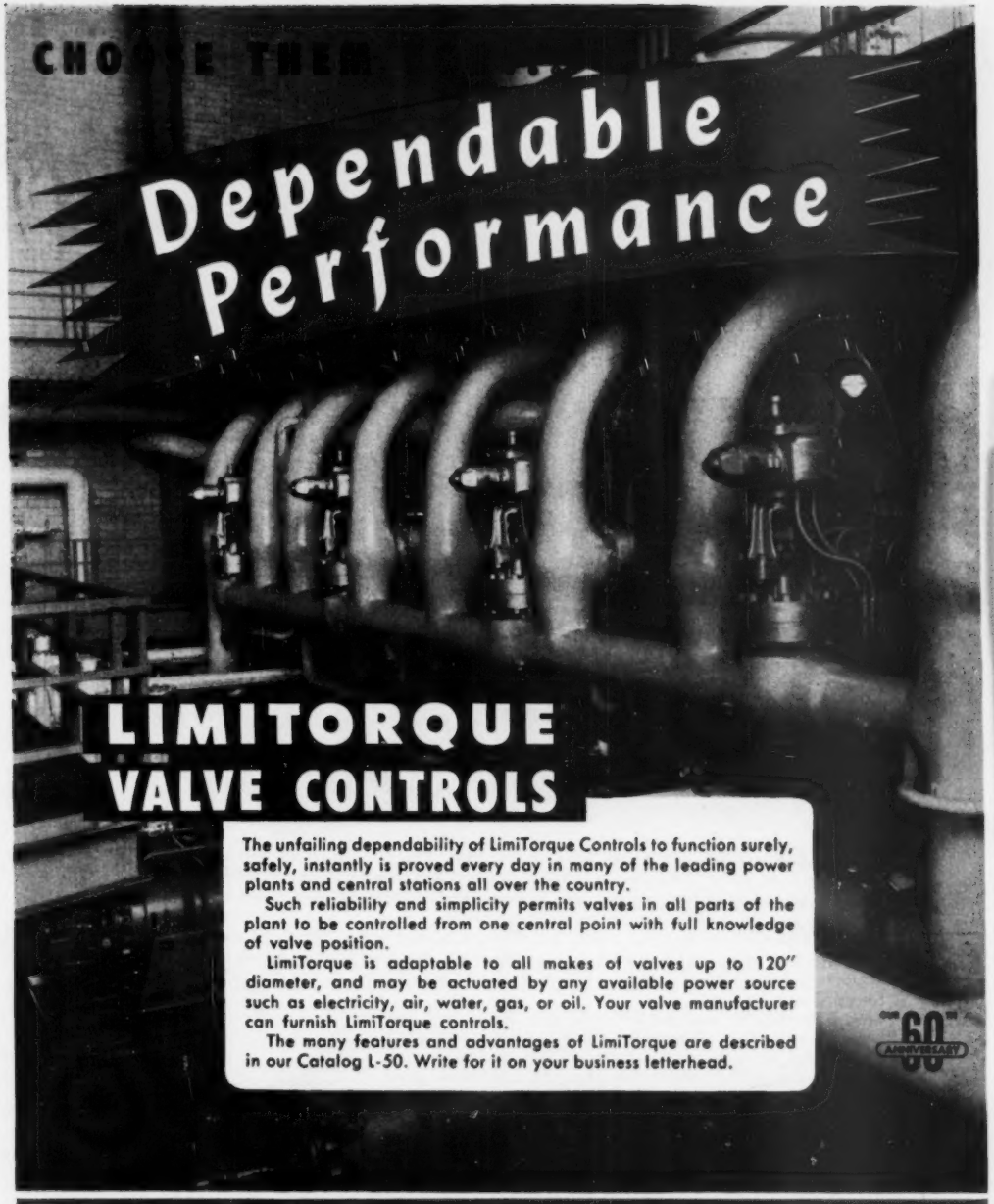
FREE BOOKLET—Gives complete engineering data on the new Kaiser Aluminum Conductor. Includes both weatherproof and self-supporting conductor. Send for it today!



THREE-IN-ONE—Triplex is a single cable made up of three wires—two neoprene or polyethylene covered wires cabled about the bare neutral messenger. Coverings are light, free-stripping, clean to handle.

FOR SECONDARY LINES—In many cities Kaiser Aluminum triplex cable is now being installed in secondary lines. Aluminum duplex cable is being used on street lighting circuits.

TECHNICAL ASSISTANCE—Service engineers with years of experience in the conductor field will gladly provide technical assistance. Call any Kaiser Aluminum office. See your Classified Telephone Directory.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Dependable Performance
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VALVE CONTROLS
The unfailing dependability of LimiTorque Controls to function surely, safely, instantly is proved every day in many of the leading power plants and central stations all over the country.
Such reliability and simplicity permits valves in all parts of the plant to be controlled from one central point with full knowledge of valve position.
LimiTorque is adaptable to all makes of valves up to 120" diameter, and may be actuated by any available power source such as electricity, air, water, gas, or oil. Your valve manufacturer can furnish LimiTorque controls.
The many features and advantages of LimiTorque are described in our Catalog L-50. Write for it on your business letterhead.
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SPLICE or DEADEND STEEL STRAND

in seconds without tools

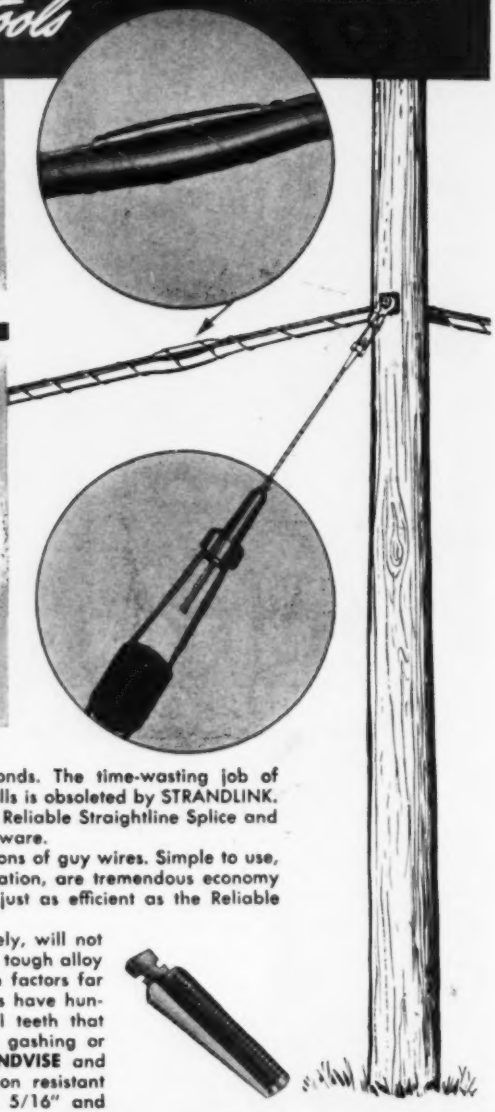
Reliable

STRANDLINK

or

STRANDVISE

can cut installation time by 90%



STRANDLINK splices messenger wire in seconds. The time-wasting job of handling nuts, bolts, hardware and johnny balls is obsoleted by STRANDLINK. STRANDLINK is used just like the well known Reliable Straightline Splice and costs far less than conventional splicing hardware.

STRANDVISE finds its greatest use in installations of guy wires. Simple to use, the time and wire saved, especially on relocation, are tremendous economy factors. STRANDVISE is just as easy to use, just as efficient as the Reliable Straight-thru Deadend.

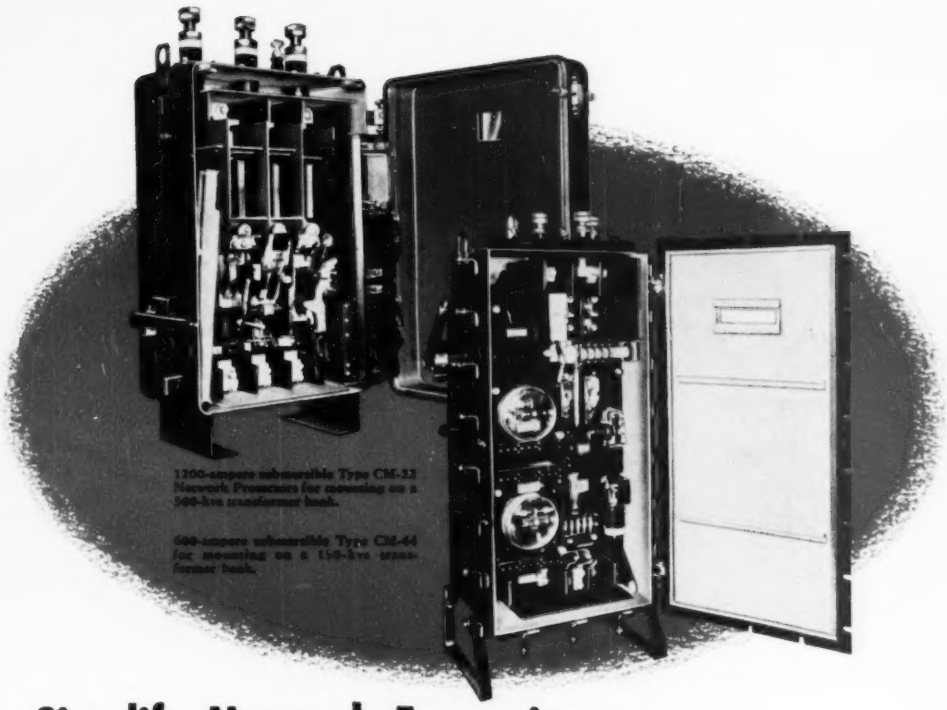
Both **STRANDLINK and STRANDVISE** grip surely, will not slip. The cartridges of heat treated aluminum, tough alloy yokes, and stainless steel bails have strength factors far beyond that of the strand. The gripping jaws have hundreds of case-hardened, Zinolite-plated steel teeth that grip sharply, hold permanently yet without gashing or exposing bare steel of strand. Every **STRANDVISE** and **STRANDLINK** is factory treated with corrosion resistant lubricant for protection. Available in 3/8", 5/16" and 1/4" sizes.

Reliable **ELECTRIC COMPANY**

3143 CARROLL AVENUE
CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES



1200-ampere submersible Type CM-22 Network Protectors for mounting on a 500-kva transformer bank.

600-ampere submersible Type CM-44 for mounting on a 150-kva transformer bank.

Simplify Network Expansion with Westinghouse NETWORK PROTECTORS

You can expand your network system simply—and economically—with Westinghouse Network Protectors. The reason—Westinghouse heavy-duty and medium-duty protector use the same relays. Hence, as load grows medium-duty (CM-44) protectors can be replaced with heavy-duty (CM-22) protectors and suitable transformers—*without upsetting system co-ordination!* CM-44 units may then be moved to lighter load areas.

Keep this important Westinghouse feature in mind as YOU plan your network system. It's a *sure* way to provide for simple, low-cost expansion of that system when load conditions dictate.

Ask your Westinghouse representative for further information . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60778

ONLY WESTINGHOUSE NETWORK RELAYS . . .

- Eliminate gears that cause friction and wear.
- Have a sensitive reverse-current setting that can be varied from .1% to 10% of the network protector rating.
- Have bearing surfaces readily accessible for inspection and cleaning.
- Have relay terminal screws that eliminate the need for additional testing facilities in the control wiring.
- Provide a nonsensitive relay that permits sensitive tripping after a time-delay.

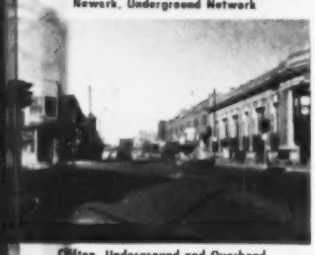
YOU CAN BE SURE... IF IT'S

Westinghouse

NETWORK PROTECTORS

NETWORK SYSTEMS PAY... IN *NEW JERSEY!*

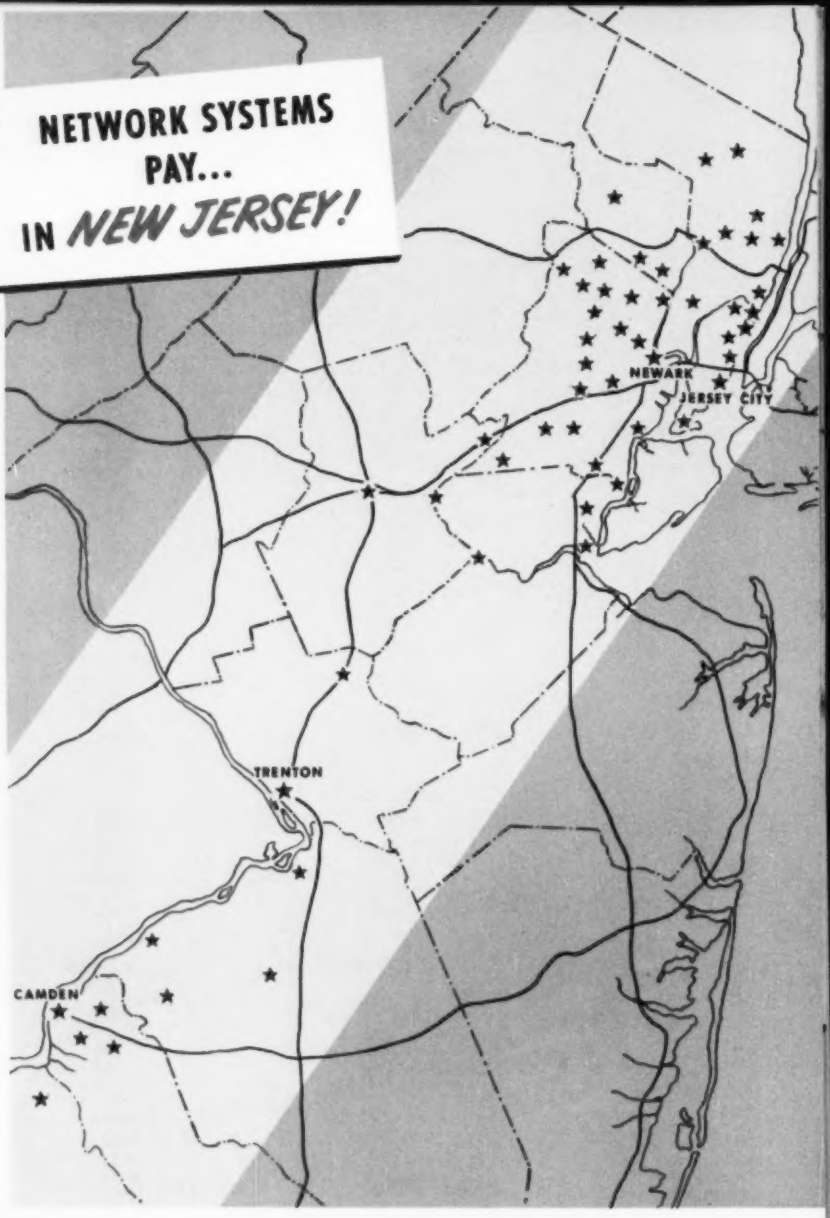
Newark, Underground Network



Clifton, Underground and Overhead

East Orange, Underground Network

Princeton, Underground Network



Trenton, Underground Network

Teaneck, Underground Network

Union City, Underground and Overhead

Moorestown, Underground Network

Advance Planning at its BEST!

Most interesting fact about this largest single utility group of networks is the unmistakable evidence that farsighted planning paid! For this alert utility took bold preventive action more than 20 years ago. And when peak loads had doubled, Public Service Electric & Gas Company of New Jersey was really ready!

Public Service serves 1,234,287 consumers in progressive and fast-growing New Jersey. It was among the first to recognize the long-range merits of the A-C Secondary Network System. Beginning in 1928, with its first network in Newark, Public Service had 5 in operation by 1930. By 1940, the number of networks had swelled to 90. Today this utility has a total of 94 networks . . . underground, overhead, and spot . . . serving a wide variety of load requirements in fifty-six communities . . . ranging in size from 4,189 to 438,776 . . . throughout this important industrial belt. The views on these pages show typical communities so served.

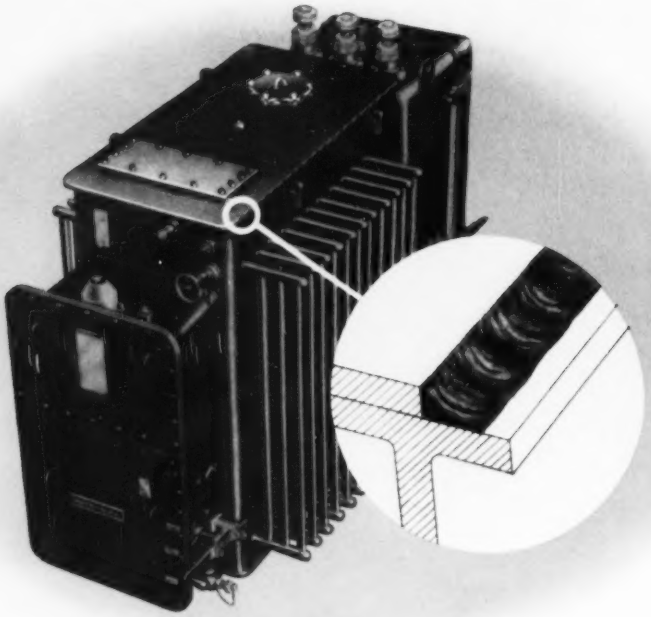
Because of intelligent advance planning, the tremendous expansion of the war and postwar years, which practically doubled peak loads throughout this network area, presented no problems! The unusual flexibility of the A-C Secondary Network System enabled Public Service to offer high standards of service continuity to small communities as well as large ones. The Network System can provide unusually high service continuity for your customers and reduce power distribution costs too! Investigate all of the economic advantages of the A-C Secondary Network System . . . now is the time to prepare for tomorrow's expanding loads. Call or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-97159

Westfield, Underground Network

Our Lady of Lourdes Hospital, Camden, Underground Spot Network

YOU CAN BE SURE...IF IT'S Westinghouse

NETWORK EQUIPMENT



NO COVER BOLTS! NO GASKET!

Another Maintenance Problem Reduced!

It's a major maintenance problem when oil sludges and insulation oxidizes.

Leakage of air and moisture is most likely to occur through the main cover gasket. That's why Westinghouse recommends welded-on covers for network transformers. Leaks are prevented . . . uncontrolled breathing eliminated.

It is still necessary, however, to gasket some switch and terminal chamber covers, bushings, oil gauges and handhole covers. Cortite* gaskets, composed of cork particles individually surrounded and bonded in special synthetic material, have been developed for this purpose. They provide a long-lasting, seepage-proof seal.

These two features, welded-on covers and improved gasketing for small openings, serve to greatly lessen the possibility of oil sludging and oxidation of insulation.

Removal and replacement of welded covers, if necessary, is easier and quicker than the gasket-and-bolt technique. For proof, ask your Westinghouse representative to arrange a showing of the ten-minute movie, "Welded-on". All operating and maintenance supervisors should see it. Phone today or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

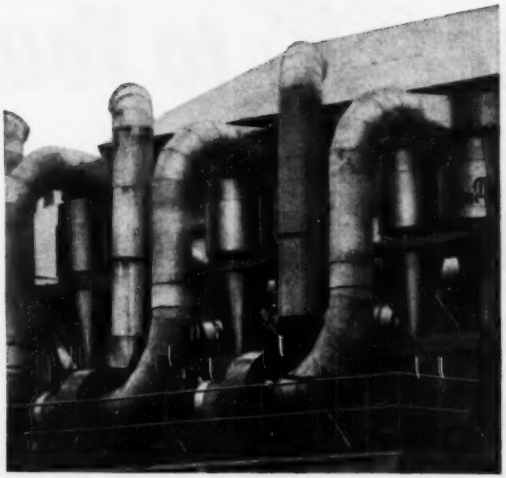
YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK TRANSFORMERS

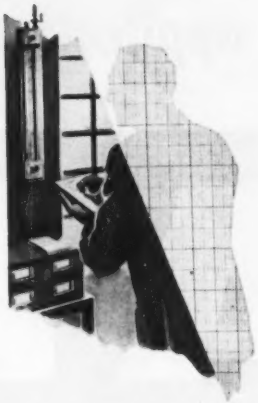
*Trademark

J-70622



Buell Cyclones installed in series to collect nuisance dust at a steel plant. High efficiency operation is assured by exclusive 'Shave-off' feature.

Worrying About Fly-Ash Discharge?



This industrial 'dust' man can help determine the Dust Abatement System most efficient for you!

The Buell organization of industrial 'dust' men is devoted solely to the design and construction of dust collection equipment that will most efficiently and economically solve your plant's specific Stack Dust problem.

For more than 18 years we have been doing just this for all American industry. Every Buell installation is a custom-designed system, engineered to hold stack dust discharge down to the practical limits which assure improved product and/or process, better plant-community relations, higher levels of employee morale.

For full information about Buell's ***3 basic systems*** of dust collection, and how one can be applied to the solution of your stack dust problems, write today. Ask for the new informative bulletin titled, "The Collection and Recovery of Industrial Dusts." Do it now. Buell Engineering Co., Dept. 60-D. 70 Pine Street, New York 5, N. Y.

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ELECTRIC CYCLONIC

HIGH EFFICIENCY CYCLONES • ELECTRIC PRECIPITATORS
TYPE 'LR' COLLECTORS • LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS • DUST HOPPER VALVES

ENGINEERED EFFICIENCY IN DUST COLLECTION

"More Power to You".®

through GENERAL CABLE experience and know-how in the manufacture and application of...

ALEC

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PIONEERS IN ALU

TRAL

WIRES and CABLES

Twenty years ago, ALECTRAL pioneered the use of aluminum as a conductor for all purposes. The name was assigned to wires and cables of high tensile strength *aluminum*, engineered as solid or stranded conductors for transmission and distribution service.

Today General Cable can supply all types of ALECTRAL, including ALECTRAL-ACSR (bare and weatherproof), ALECTRAL Weatherproof ("O.K.", "Peerless", "Tip-Top" and Polyethylene covered) and ALECTRAL Insulated Service Drop and Entrance Cables.

General Cable manufacturing and field experience with aluminum conductors well qualifies our engineers to offer intelligent and practical counsel to the many who are planning to use aluminum conductor cables on current or future projects.

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

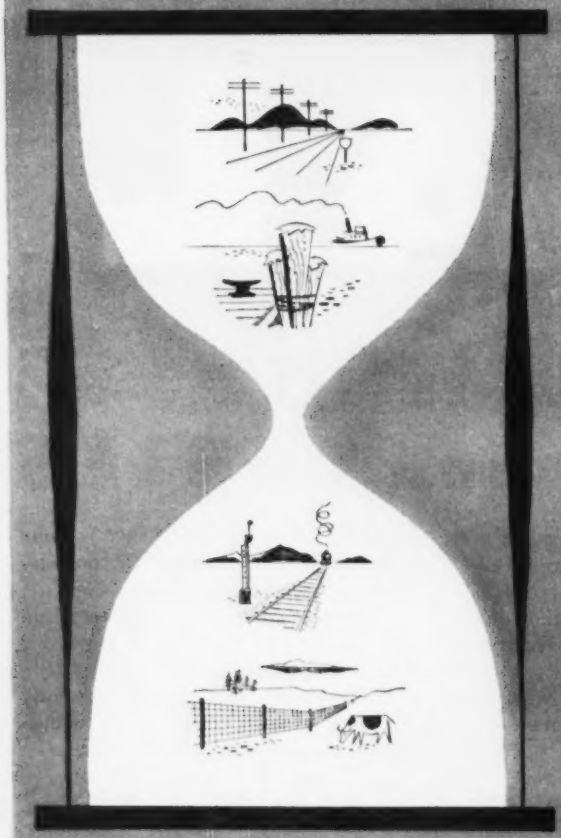
"ALECTRAL", "O.K.", "PEERLESS" AND "TIP-TOP" ARE REGISTERED TRADE MARKS OF GENERAL CABLE CORPORATION

INUM WIRE AND CABLE

Of all wood preservatives... only

Coal-Tar Creosote

has been proved in the test of **time**



FOR MORE THAN 100 YEARS, UNDER THE MOST SEVERE AND EXACTING CONDITIONS, Coal-tar Creosote—and ONLY Coal-tar Creosote—has been proved successful.

IN COLD CLIMATES, Barrett* Coal-tar Creosote does not weaken wood—allows wood to retain maximum strength. Poles sustain weight of ice, resist storms.

IN HOT CLIMATES, Barrett Coal-tar Creosote stays longer in the wood. Protects against termites and decay.

IN DRY CLIMATES, Barrett Coal-tar Creosote retards splitting, brooming and shattering of crossties—reduces checking and splitting of poles. Its lubricating action on wood fibres reduces mechanical wear on crossties.

IN SWAMP AREAS, Barrett Coal-tar Creosote fights off decay. Resists high moisture content and infection from other decaying wood and debris.

IN FRESH WATER, Barrett Coal-tar Creosote resists leaching action. Negligibly soluble in water, it is ideal for submerged structures and structures exposed to rapidly-moving water.

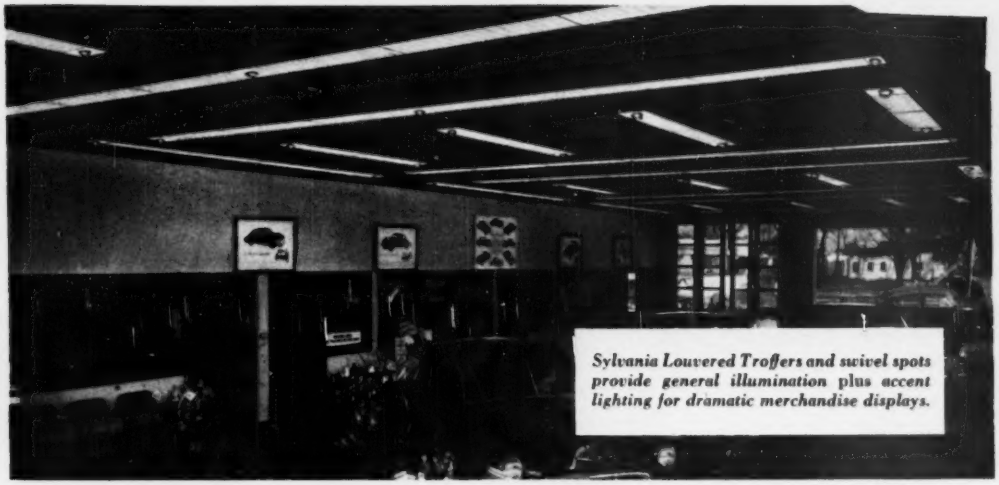
IN SALT WATER, Barrett Coal-tar Creosote guards effectively against marine borers. Coal-tar creosote is the ONLY wood preservative proved consistently effective against teredos, limnoria and other salt-water enemies of wood.

Barrett
Coal-Tar Creosote

Barrett

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

*Reg. U. S. Pat. Off.



Sylvania Louvered Troffers and swivel spots provide general illumination plus *accent lighting for dramatic merchandise displays.*

DRAMATIC CEILING LIGHTING... FOR BETTER SEEING... BETTER SELLING

New versatile Sylvania Troffers make lighting a part of interior design. You can make lighting an integral part of ceiling design with the improved line of Sylvania Troffers.

These shallow, versatile units may be recessed in practically any ceiling to form decorative lighting patterns. They give ample illumination where required . . . without interrupting planned architectural simplicity.

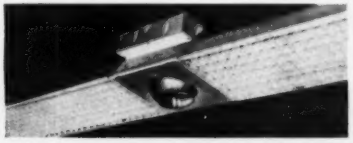
New flexibility

You'll find Sylvania Troffers adaptable to a great variety of modern needs. Available in two, four, six or eight-foot lengths . . . for single or continuous row installation. Equipped with choice of shieldings which include 45° x 45° louvers, translucent ribbed Albalite glass, Twinlite concentrator type lens, curved glass lens or light-weight plastic. Spotlights and corner boxes to match!

Easy maintenance is another important feature. Shielding frames are hinged for quick tube replacement . . . close tightly with a spring latch.

So, for new installations or remodeling jobs, remember Sylvania Troffers. New folder gives full details. Mail the coupon for your copy now.

Sylvania Troffers, with Albalite shielding, also provide attractive "pattern" lighting for informal or non-working areas.



Detail photo shows 45° x 45° louver shielded troffers in continuous row with swivel spotlight.

SYLVANIA

FIXTURES, FLUORESCENT TUBES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

Sylvania Electric Products Inc.
Dept. L-3004, 1740 B'way, N. Y. 19, N. Y.

Please send me illustrated folder describing the full line of Sylvania Troffers.

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Street _____

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Where only the best is a bargain!

On a really tough hauling job, a truck's either got it, or it hasn't.

You either make money or you lose it. Only the *best* truck engineered for the job is a bargain for the operator.

That's why you see so many Internationals on tough jobs. That's why you'll be money ahead to see your International Truck Dealer or Branch and get the *best* truck engineered for your job. Why not make it *soon?*

INTERNATIONAL HARVESTER COMPANY · CHICAGO

Get the facts about International's features:

- All-truck engines—exclusively for truck work—built in the world's largest truck engine plant.
- The "roomiest, most comfortable cab on the road"—the Comfo-Vision Cab designed by drivers for drivers.
- Super-steering system—more positive control, easier handling and 37° turning angle.
- Traditional truck toughness that has kept International first in heavy-duty truck sales for 20 straight years.
- 115 basic models . . . everything from ½-ton pickups to 90,000 lbs. GVW off-highway models.
- America's largest exclusive truck service organization.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

INTERNATIONAL TRUCKS

"Standard of the Highway"

Model L-192 with special utility body and winch, 175-in. wheelbase, 25,000 lbs. GVW

Because you demand your switches **RUGGED**..

Above, type HPS, 3000 Ampere switch in open position—showing how outer pair of blades have progressed slightly beyond inner pair during sequence operation.

1 CONTACT—Hi-Pressure spot-cleans as it wipes as it closes. High conductivity to withstand short circuit stresses.

2 HINGE—Hi-Pressure, annular line contact—seals against dirt, always constant in any blade position. Uniform pressure washer maintains contact pressure with less critical adjustment than ordinary cup spring washer.

3 BLADE LATCH—Positive protection against short circuits. Combined lock and pryout operated with eye hook.

4 PRESSURE CLIPS—Phosphor Bronze individual spring clip for each Spot Contact on blade.

5 BLADE OPERATION—Sequence movement. Blades released from contact pressure in pairs to reduce operating effort.

R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES, INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

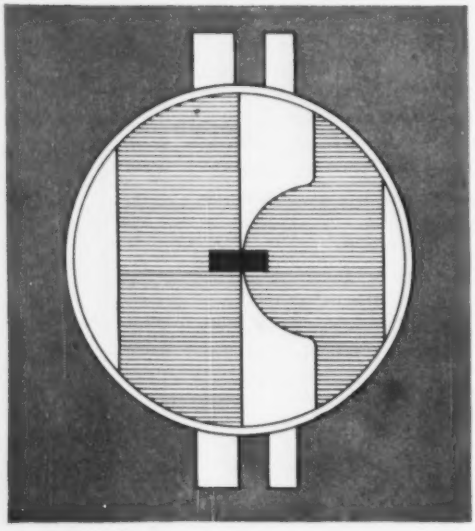
METAL CUBICLES

TESTING DEVICES

new tap changer design

KEEPS TRANSFORMERS ON THE LINE . . . CURBS MAINTENANCE

New Tap Changer for De-energized Operation on Allis-Chalmers Power Transformers Combines Basic Principles and Precision Workmanship to Give Unexcelled Service Performance.



ONE CURRENT PATH PER CONTACT, established by rounded point on a flat surface, assures high contact pressure. Both magnetic and applied forces are concentrated at this single point on the contact surface.

THE IMPROVED PERFORMANCE found in the new Allis-Chalmers tap changer is the result of a radically different contact principle that insures cool, long-life operation and makes contact deterioration virtually impossible.

The tap changer is designed so that the current path on each contact is established under high pressure by means of a rounded point on a flat surface. The union is cool and positive. At the same time, flexible action maintains equal pressure on moving members, making them completely self-aligning . . . an important factor in service continuity.

Utilizes Magnetic Forces

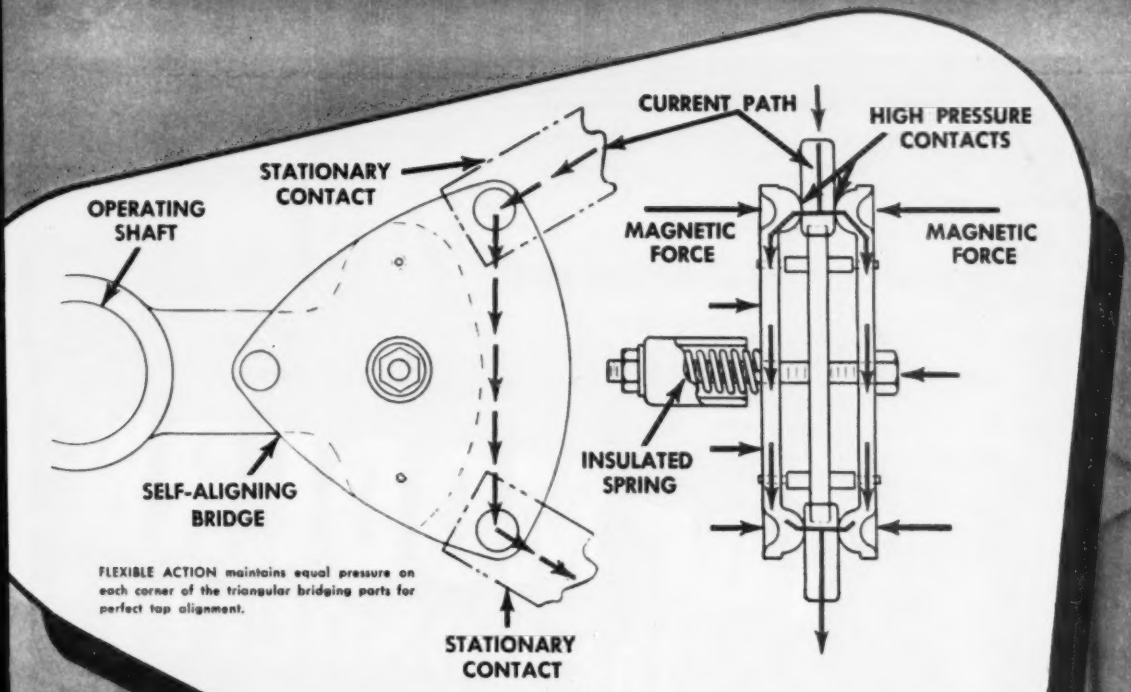
A distinctive feature of the new tap changer is the contact bridging member with parallel parts carrying current. By utilizing magnetic forces created by heavy current, contact pressure is actually increased. This automatically prohibits "throw open" action caused by short circuits on the electric power system.

Self-Cleaning Contact Action

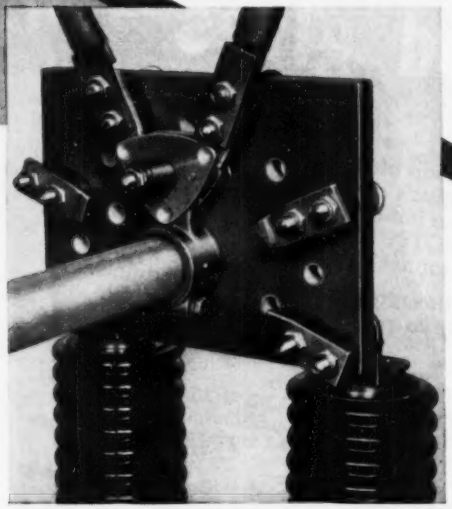
Magnetic forces added to a strong applied force provide a low resistant path for current. Self-cleaning action of contacts eliminates carbon growth and reduces heating.

Engineering of this kind can save you money on your next power transformer installation. Why not investigate its benefits today.

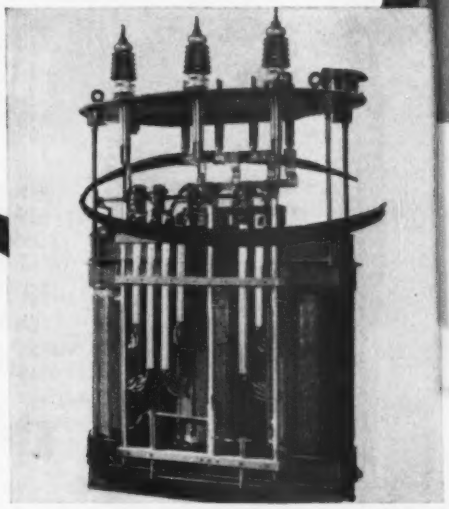
A-3644



FLEXIBLE ACTION maintains equal pressure on each corner of the triangular bridging parts for perfect tap alignment.



THIS VIEW of the new A-C tap changer shows moving contact member bridging the stationary tap lead connections. The tap changer employs copper-to-copper rounded point contacts. Voltage stresses and corona were reduced by keeping sharp corners and edges to a minimum.



MOUNTED ABOVE the core and coil assembly, this new tap changer is easily accessible for periodic inspection through the cover handholes. Tap positions are changed on all phases simultaneously.

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

A-C ALLIS-CHALMERS

for MODERN ... the CONDULET* method gives YOU

A modern installation of Condulets and rigid conduit is always ready for quick change-over to meet the needs of today's fast moving industry . . . without sacrificing the vital qualities of PROTECTION to electrical conductors and SAFETY to personnel, equipment, and the plant.

Only Crouse-Hinds sturdy cast Feraloy Condulets and rigid conduit can give you ALL of these 8 definite advantages:

1. **FLEXIBILITY.** A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates can be used to make it easy to change circuits or add new ones.

2. **MECHANICAL PROTECTION.** Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible protection against accidental damage to the wiring and equipment. Prevents costly shutdowns.

3. **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.

*CONDULETS are made only by CROUSE-HINDS

Actual size photograph of a ¾-inch Obround Conduiet. Sizes ½ to 6-inch A type for every purpose.

CONDULETS · TRAFFIC SIGNALS

WIRING and rigid conduit 8 BIG advantages

4 SAFETY. Ground continuity is of vital importance. CONDULETS with taper threaded hubs and rigid conduit with tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This safety feature assures maximum protection against personal injury and fire.

5 UNIVERSAL APPLICATION. You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.

6 ECONOMY. The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.

7 QUALITY. The trademark CONDULET stands for the highest quality, reliability, and long life.

8 VARIETY. More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit . . . the universal wiring method.

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Complete Installation of a Condulet and Rigid Conduit System in a Modern Metal Working Plant

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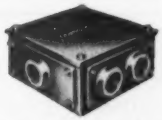

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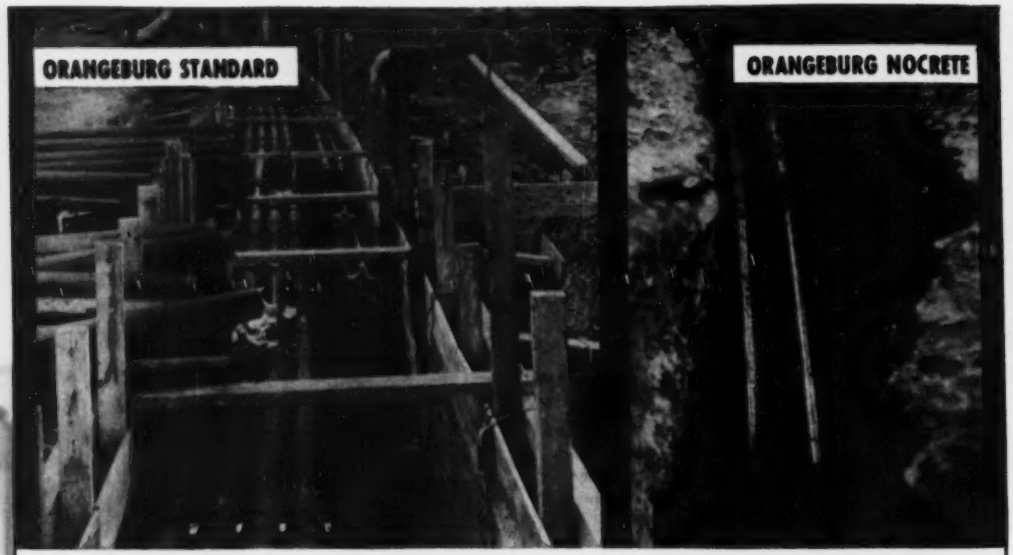

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This record of 58 years underground pays tribute to the uniquely tough, strong, resistant materials of which Orangeburg Conduit is made . . . and their capacity to withstand corrosive ground waters and chemical wastes permanently.

Also important to utility companies is the fact that Orangeburg Conduit is easy to handle, transport, install . . . low in initial costs.

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TIME-TESTED ADVANTAGES

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New RCA Fleetfone Station Consolette

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RCA's new 2-way radio *Fleetfone* "DESK STATION"

Now . . . a 60-watt transmitter plus receiver in a single case. Saves space. Simplifies operation. Makes maintenance easier. Read how . . .

Good news for 2-way radio users! A "desk station" you can install 'most anywhere . . . on a desk, a table, or even on a shelf against the wall.

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Precision controlled by RCA ovenless crystal unit, with spurious emission reduced to minimum. Two-frequency or three-frequency transmission possible. Very economical to operate. Most tubes work at less than 70% capacity. Result: longer tube life, less maintenance. Uses standard tubes.

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Find out all about this great new "desk station" that gives you full-power performance from a single package. All backed up by RCA . . . world leader in radio. Service available from RCA Service Company if desired.

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Also, please send me information on use of 2-way radio in industry checked below:

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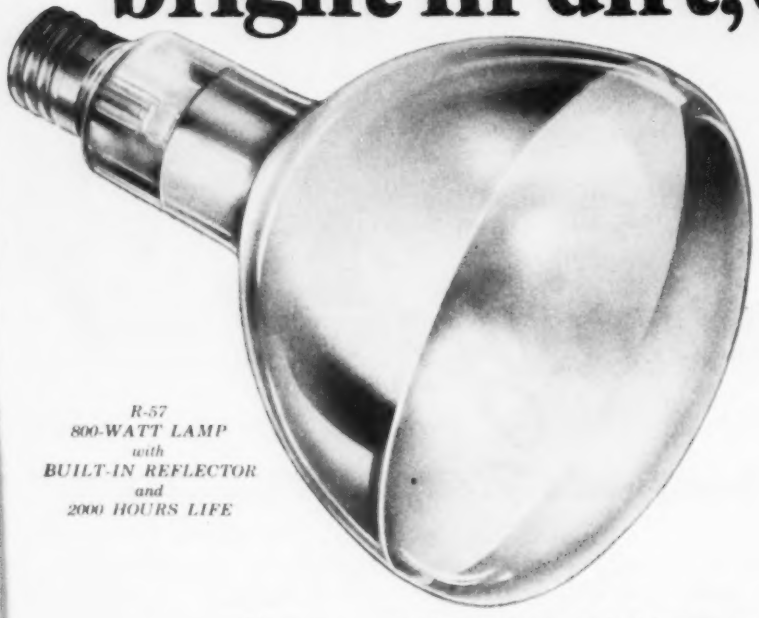
New Westinghouse bright in dirt, dust,



R-57
800-WATT LAMP
with
BUILT-IN REFLECTOR
and
2000 HOURS LIFE

Now you can get bright light *longer* in high-bay areas, no matter how dirty, dusty or smoky the conditions. The new Westinghouse R-57 800-watt standard voltage lamp, with a special silvery reflector actually built inside the bulb itself, prevents dirt particles from reducing its highly efficient light output. Dust settles only on the sides, not on the light-emitting face, so no cleaning is needed.

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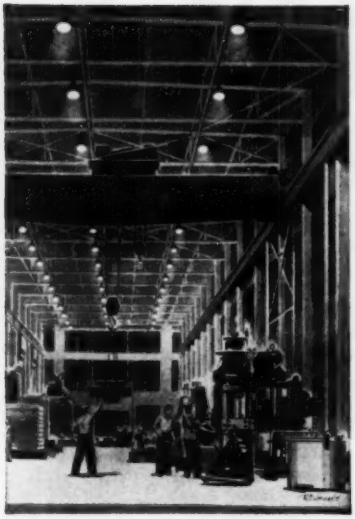

ACTUAL EFFICIENCY STUDIES PROVE new Westinghouse R-57 800-watt lamps out-live, out-perform conventional lamps. And their special design makes them ideal, especially for high-bay lighting in foundries, mills and other industries where dust is a problem.

R-57 WESTINGHOUSE LAMPS have built-in reflector, stay bright longer with no cleaning; give more efficient light at lower cost.

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NEWS FROM WESTINGHOUSE, THE FASTEST-GROWING LAMP MANUFACTURER

by Sam Hibben

DID YOU KNOW? Owls see in near-darkness (not in total darkness, which almost never exists outdoors) because of the nature of their eyes and not the size of them. Because of two shapes of nerve-ends in the back of the eyeball, we say that humans have both "rod" vision and "cone" vision. The rods take over in dim light while the cones function in brighter light and give us color perception. Owls, cats, and other night-life have mostly or entirely "rod" vision, hence see moving objects in the dimmest lights, because apparently the nerve-rods work in bunches, thus multiplying the sensitivity.

ON THE OTHER HAND—While blackout driving proved possible but unsatisfactory in war-time, the effort of auto safety experts is to approximate daylight seeing conditions as nearly as possible—at least to make roadway objects visible as far ahead as it takes to stop your car—roughly 300 feet. Headlights today are so highly scientific that a pair of small 45-watt filaments illuminate a road area at least 20 times the largest living room. Their complexity is shown by the fact that Westinghouse Sealed Beam Headlamps, for instance, have 121 individual prisms, and all of these direct separate beams of light picked up from various parts of the reflector. I guess that makes them about 60 times as complicated as bi-focals, no?

SAFETY NOTE: If you ever blow a fuse in your car on a busy highway at night, illuminate the interior of your car with a flashlight; it makes the windows visible for a long distance, warns other motorists.

More next month.

Samuel G. Hibben

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FLUORESCENT LAMPS
STILL COST YOU LESS
THAN THEY DID
IN 1940, YET BURN
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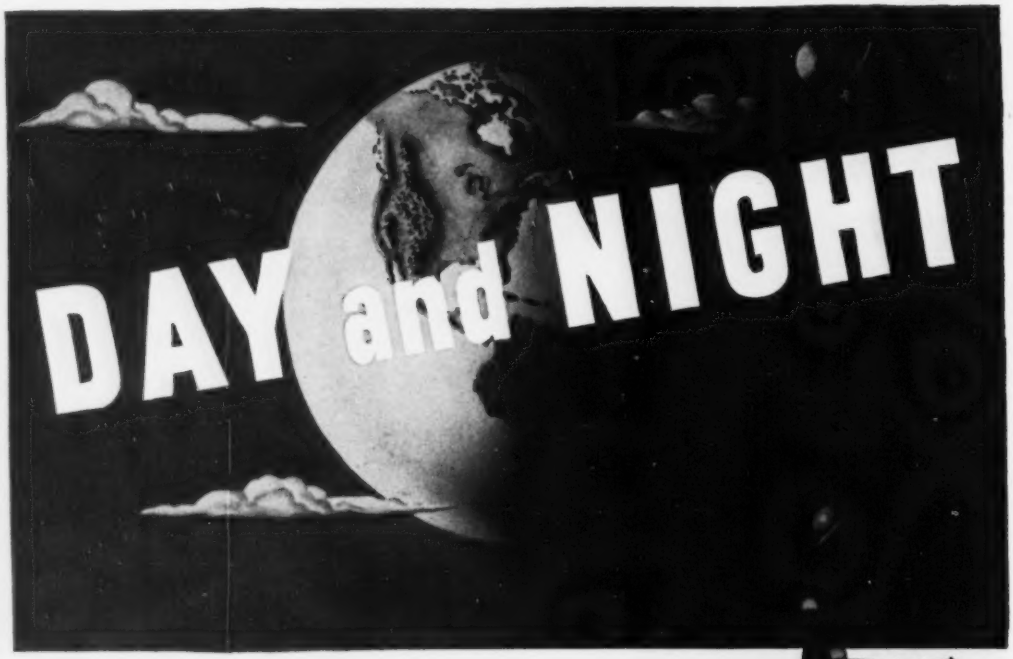
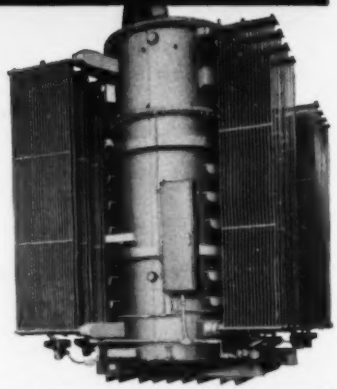
are at work . . .



WHEREVER electricity is transmitted and distributed . . . here in the United States, or in places far remote . . . you will find Moloney Transformers and Regulating Equipment. An ever growing market has been accepting and using our product since 1896. In all this time the name Moloney on a Transformer has come to mean that better performance and greater reliability can be expected of that transformer. We are proud of our reputation and proud of your confidence in us.

Our efforts in engineering, research and design are directed toward the maintenance of this leadership and the result is . . . a better product today . . . an even better product tomorrow.



Illustrated, Moloney Power Transformer rated 35,000/46,667 Kva, 3-phase, 60 cycle 138,000 Grd. Y to 13,200 volts.

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Chapman and Utilities Can Solve Missouri Valley Problems

Speaking to the American Power Conference in Chicago, N. Bernard Gussett, president of Iowa Power & Light Co, proposed immediate action to solve the Missouri Valley development problems. He suggested to the Secretary of Interior that he invite representatives of utilities of the Missouri Valley to meet with him for this purpose. Copies of his proposal are being sent to Congress and the governors of the Valley states.

The urgency in Gussett's plan is adequately set forth by his claims relative to the current situation. But back of this is the continuing refusal of government men with authority to talk with utility representatives. Gussett does not oppose reasonable plans for flood control and hydroelectric development in the valley. But he believes that citizen-responsibility planning should replace centralized federal government planning in this case. This belief is based upon the fact that one-sixth of the land area of the nation and many billions of the taxpayers' dollars are involved. He points out that in one way or another the plans affect just about every phase of American life. And for this reason Gussett calls upon all farm, business, governmental, labor, and civic groups to demand that the planning in its entirety be brought into the open and made available to them.

In analyzing the factors involved in the Missouri Valley program, Gussett points out that "the federal government will generate and sell considerable hydroelectric power in connection with the hundreds of millions of dollars which have been spent, are being spent, and are planned to be spent on large dams in the Missouri watershed."

"There is no question," he said, "but that the Department of the Interior—has made extensive plans for supplying certain preference customers. However, I seriously doubt that such plans offer promise of more than a minimum advantage to the United States Treasury, since, among other things, they obviously are not based on extensive investigations regarding integration with existing thermal-electric plants or the use of transmission facilities of existing electric systems for the delivery of this power."

Gussett points up his claims by saying that he has reason to believe "that the amount of dependable firm power which will result from these federal Missouri Valley developments will be surprisingly small." In addition he is "inclined to the belief that when, if ever, the construction and operating cost figures of these Missouri Valley projects are subjected to the merciless light of publicity and to unbiased analysis, the resulting power costs will be found surprisingly high."

We believe Mr Gussett has made a good case for an open book policy on the Missouri Valley. In view of his request, backed up by the utilities in his area, the Secretary of the Interior should agree to meet with utility representatives. This is the only fair and democratic way to solve the Missouri Valley problems.

How Green Is Your Valley?

"Your Valley—Your Future" is a color movie, with narration by Lowell Thomas, planned and produced by nine New England power companies. It poses the problem of the need for conservation and planning for use of the natural resources of the Connecticut River Valley. It was shown to 60 representatives of recreational, educational, conservationist, industrial, electric power, and other utility organizations recently gathered at Hanover, N. H., for a conference on the natural resources of the valley.

The solution unanimously chosen by the delegates was the formation of the Connecticut River Valley Council. This group will set about to establish a permanent body comprised of all parties interested in the common natural resources of the valley. It will have a membership drawn from Connecticut, Massachusetts, New Hampshire, and Vermont.

The council hopes to pattern its permanent body after the Brandywine Valley Association of Wilmington, Del. This association has dramatically illustrated since its inception in 1945 what the citizenry—farmers, sportsmen, mill workers, local business men—can do to conserve the soil, reduce river pollution, and preserve wildlife and natural beauty without the fetters of government direction and red tape. The BVA crosses township, county, and state boundaries.

Clayton Hoff, executive vice president of BVA, operates on the principle that the local people know more about what should be done in their valley than some government official located miles away. With much the same spirit the representatives from the Connecticut Valley voted to do for themselves and by themselves what has to be done. But this move was not made until they were prompted and encouraged by the local power companies.

It would be well for a power company whose customers and livelihood are associated with a valley to take stock of its own situation. What is being done in the way of soil conservation, better farming methods, reduction of river pollution, improvement in recreational and wildlife conditions? And of more importance, what remains to be done? Herein lies an opportunity for that power company to secure its future by encouraging its customers to improve and restore their valley.

Let the Facts Tell the Story

Richard Brinsley Sheridan, English playwright, once accused one of his contemporaries of being indebted to his memory for his jests and to his imagination for his facts. An engineer who has wanted to justify his kind of distribution system construction could likewise draw upon his imagination for his substantiating facts. Hardly anyone could refute his claims because facts about distribution system performance have been scarce and scant. Certainly so by comparison with the long-compiled and well-analyzed data about low-voltage networks, high-voltage cables, and, more recently, transmission lines. Hardly two unrelated utilities have similar standards of construction. Not even the National Electrical Safety Code is based on demonstrable facts about the real sturdiness and lastingness of the construction it prescribes.

Academically the remedy would be to get the facts about distribution performance and then let the conclusions be a direct guide to the best and economically sound construction. Such a move was initiated a couple of years ago under the auspices of a joint AIEE-EEI committee. It has not had enthusiastic cooperation because some companies felt the accumulation of performance data about a field as diffuse and as responsive to a multiplicity of local influences would hardly pay out in lessons learned. However, a considerable number have contributed data. They have reached the conclusion that with half their entrusted capital in distribution they would be remiss it they did not know what they are achieving with distribution outlays. They apparently concluded that there was a good chance of finding ways to save. After a few years of collecting information these savings could grow to a level where they far offset the cost of securing the information.

It has been a long heydey for some who have been opinionists and hunch-worshippers in the field of distribution system design. They may have to bow to the potent and persuasive facts after the survey has been rolling a few years.

Sell Customers on Overhead Lines

Public pressure to put lines underground has been getting more acute in some areas. The disposition has often been to attribute the agitation to political stirrer-uppers with selfish motives. But that attitude merely ignores the symptoms and maybe overlooks some new causes—particularly in connection with transmission and sub-transmission.

In the latter categories more lines are being built around and into the cities to serve substations that once were served largely by radial lines outward from the industrial and commercial centers through industrial and commercial areas. Many such feeders were underground cables. The desire now is to build open-wire lines into the cities from without and these perforce have to pass through suburban and residential areas. It is really not strange that the residents can be organized into resistance or obstruction patterns.

Some companies are fully conscious of these changed circumstances and they have had notable success with candid ways of meeting the situation. The astuteness and chicanery of the proverbial "right-of-way man" had largely passed from the scene anyhow but then passing was not in itself deemed sufficient. Instead the move was to arrange for community meetings in advance of the line-building program. The town folk were told very frankly what the program was, how much of it they were causing by their incessant demand for more kilowatt-hours and how much the outlay was to be. Before anyone could throw the underground monkey wrench into the proceedings the group was shown in simple terms why it would cost 4, 6 or 8 times as much to substitute underground construction. They were confronted with an honest choice: Would we rather collaborate in the overhead line program or face increased rates to carry the underground? It was that simple, and the agitator could not shoot because the primer had been extracted from his bullets.

The argument can be quelled before it ever gets to the town council, the state commission, or the courts. Across-the-table candor has done it.

THE ELECTRICAL WEEK

Featured in the News

Hells Canyon Dam controversy rumbles through a House subcommittee (p 94) . . . Charlie Wilson quits over disagreement with President on formula for settlement of **steel dispute** (p 96) . . . Truman's decision not to run will bring changes, but won't change the whole **public power** picture (p 96) . . . First American Power Conference hears nation will be producing **5 trillion kwhr** annually by 2000 A.D. (p 98) . . . Tornadoes are over, but not the cleanup, so far as Arkansas Power & Light is concerned (p 100) . . . **Truman order** scrapping part of voluntary credit restraint program clears way for PUD's to buy Puget Sound Power & Light Co (p 101).

• • •

Latest from Washington—New Southeastern Power Administrator is **Charles W. Leavy** who has been chief counsel for the agency. He succeeds the late Ben W. Creim . . . House Appropriations Committee trimmed only $135,000 from **REA's salary and expense budget** for fiscal 1953. REA asked more than $8.25 million for these items . . . Agriculture Secretary Charles F. Brannan has invited **NRECA to name a representative** to a group created to advise him on farm co-op matters . . . Another government subsidy has been granted an Arizona mining company to help maintain domestic copper production . . . Interior Secretary Oscar L. Chapman is asking FPC to reconsider its decision in granting a license to **PUD No. 1 of Pend Oreille County,** Wash., for construction of the Box Canyon hydroelectric project. Chapman wants FPC to write conditions in the license which would help settle a reclamation argument.

From New England—Entering East New Portland, Me., motorists are greeted by a sign which says: "Our Telephone Poles Hit Cars Only in Self-Defense" . . . **Cambridge (Mass.) Electric Light's** 5-year street lighting modernization program is nearly completed . . . **Northeastern University** Pres C. S. Ell says that its 437 senior engineers have from one to six job choices as June approaches. NEU conducts a five-year cooperative course based on alternate periods of 10 weeks each in industry and classroom-laboratory ambients.

From East North Central—Cleveland Electric Illuminating is considering plans to build a **floating power plant** that can be towed and anchored along the shore of Lake Erie to be used in case of an atomic attack. Company spokesmen decline to discuss details but say reports on the project are "essentially true."

From the Southeast—Alabama Power orders equipment for **complete remote control** (by microwave) of two 19,000-kva hydro units at Yates Dam. This will be first such installation by company . . . **Nantahala P&L** has just moved into its new ultra modern aluminum and glass front office building at Franklin, N. C. . . . **Duke Power** is attempting to sell several of its transportation systems to L. A. Love of Charlotte's Queen City Coach Co. . . . **Blue Ridge Electric Membership Corp,** Lenoir, N. C. asks FPC for permit for a 25,000-kw hydroelectric project in Ashe and Alleghany Counties, N. C.

From the Far West—Washington WP gets preliminary permit from FPC for 197,000-hp **hydroelectric project** on Clark Fork River in Sanders County, Mont.

Legislation—Rhode Island's Reps Eugene Lanctot and John J. Skiffington, Democrats, introduce bill to permit any municipality, if its voters say so, **to get into electric business** by building, purchasing, or leasing a plant. The bill will give municipality the power of eminent domain for condemnation and appropriation of private property . . . Rep Guy Krebs, Jackson County, Miss., introduces bill that privately owned electric and gas utilities be placed under **jurisdiction of State PSC.** Utilities would be assessed four-fifths of 1% of gross intrastate receipts for use by PSC in administering the proposed regulatory statute.

Litigation—Los Angeles Department of W&P lashes out at U. S. Central Intelligence Agency, new protestant in controversy over department plans to build an overhead transmission line north of city. Lines would interfere with operations of its monitoring station near Reseda, CIA has declared. Department says it has been advised by electronic consultants that route chosen would have less effect on the station than existing low voltage distribution lines and customers' electrical devices (EW, March 17, p 34) . . . On same day (March 27) that bids were opened on Box Canyon Dam on Pend Oreille River near Ione, Wash., landowners group filed suit in Superior Court at Newport, Wash. They seek to enjoin construction of $16-million PUD hydroelectric dam on ground that plan of financing is unfeasible and that markets for power to be generated are intangible.

Rates—Arkansas-Missouri Power gets Missouri PSC approval to increase rates by $152,250 annually which will give company a 6.35% net return . . . **City of Beaumont,** Tex., hires Clinton Owsley, utilities rate expert, to analyze Gulf States Utilities 16.8% rate hike request.

Financial—Montana Power becomes only independent electric utility in state as it buys Superior Electric Light, Telephone Works for more than $250,000 . . . **Alabama Power** gets PSC approval to merge with Birmingham Electric . . . **Indianapolis P&L** sells 30,000 shares of 4.60% preferred stock to institutions.

Labor—Virginia E&P's workers ratify 7% average wage hike (about 10½¢ per hour). Of total 3.7% is now effective with 3.3% to be submitted to WSB for approval . . . Westinghouse officials at East Pittsburgh plant negotiate with IUE leaders to settle seniority dispute. Earlier, workers staged 3-day walkout and authorized strike if necessary.

Congratulations—Shawinigan W&P promotes **A. C. Abbott** from manager of commercial and distribution department to vice president, distribution, succeeding **W. F. Mainguy** who becomes executive vice president . . . Sangamo Electric appoints **C. H. Lanphier,** formerly vice president, executive vice president . . . P. R. Mallory & Co, Inc, elects **John J. Radigan, Jr,** vice president in charge of industrial relations.

WASHINGTON COMMENT

JESSE MOCK

Electric companies have a reason to be pleased with the progress being made in trimming federal appropriations relating to electric power facilities.

Test run of the appropriations bills carrying funds for federal power projects is just about completed. The House Appropriations Committee and the House, itself, has done a fair job of trying to slow the wildfire-like spread of federal power. Attention now turns to the Senate, which some people say is called the "upper house" only because it insists on "upping" all funds bills.

There were a number of complicated political reasons why the House and its Appropriations Committee succeeded in slicing vast chunks of money from the budget requests that President Truman said shouldn't be touched. But the testimony of a long parade of electric company witnesses was an important contribution to the cuts made in the appropriations bills covering the Interior Department, Independent Offices, and Army Civil Functions.

Committee Testimony Weapon for Congressmen . . . The individual Congressman may have a number of reasons for voting for the cuts; but when he starts justifying his action in debate, he will often hark back to the testimony before the funds committee. Thus the committee witnesses, such as electric company representatives, serve a real purpose when they furnish solid arguments for the cuts.

Take the request for some $6 million by the Southeastern Power Administration to build transmission lines. More than $5 million of that request was eliminated by the committee, and most of the remaining $1 million was retained in the bill by a relatively close House vote of 108 to 92.

Harllee Branch, Jr, president of Georgia Power Co, led this fight. But he received plenty of support from officials of other southeastern power companies. Among these were L. V. Sutton, president of Carolina Power & Light Co; T. Justin Moore, vice president and general counsel of Virginia Electric & Power Co; James M. Barry, president of Alabama Power Co; James F. Crist, president of Gulf Power Co; and W. J. Clapp, president of Florida Power Corp.

Company Men Aided to Defeat Sepa Requests . . . All of these men made telling appearances before the House appropriations subcommittee on Interior appropriations in opposition to Sepa's transmission program. Branch's testimony (EW, March 10, p 92) was appealing in its simplicity and thoroughness.

Each of the other power company officials stepped up to explain just how their own firms would furnish the facilities which Sepa wanted to build. None of the men delivered long political tirades. They stuck to the facts and put their arguments into words that could be understood by laymen.

In general, these power men amplified on the statement made by Crist of Gulf Power: "The job can be done better and cheaper through the use of existing facilities of privately owned companies." So effective were these arguments that the committee and the House could not turn them aside.

In contrast, spokesmen for Sepa still insisted the money requested was necessary in order that the agency have a superior bargaining weapon when negotiating "wheeling" contracts with the companies.

From the Far West, James B. Black, president, and Robert H. Gerdes, general counsel of Pacific Gas & Electric Co, came to oppose transmission lines which the Reclamation Bureau proposed to build as a part of the Central Valley Project.

In their testimony, Black and Gerdes argued mostly along engineering lines. There was no reference to "socialism" or other scare words. Their statements before the committee might serve as models for other electric company officials who must make the trip to Washington from time to time.

Of course, there were other very excellent presentations. And on the committee side there was a surprisingly satisfactory reception.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Poles uninsulated with live-line sticks or rubber blankets may trip 12-kv breaker if brought into contact with the circuit while being raised into position.

Oil reclosers are steadily gaining in adoption but the reasons for using them, the gain in reduced outage, the installation cost, cost of servicing a lockout, and the optimum location are factors that experience alone can clarify.

Increased steam flow required at reduced frequencies to maintain generator output during system disturbance will increase the duty on all auxiliaries at a time when their output is curtailed by the same dip in frequency. A house turbine obviates some of this loss.

Non-magnetic clamps are advantageous for transmission line dampers to avoid eddy current heating.

Corrosion causes twice as much trouble in cable joints as either inferior material or poor workmanship.

Pressure at which a water stream breaks into discrete drops is determined largely by the ratio of length of the straight bore section of the nozzle tip to the orifice diameter. Insulator washing needs solid streams, oil-fire fighting broken streams.

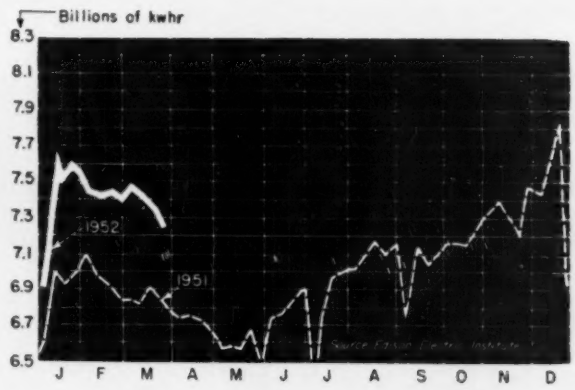
Aluminum should, to avoid accelerated corrosion, be above the copper to which it is joined. Moisture containing dissolved copper salts may form an electrolyte bridge and create a galvanic cell.

Turbine-generators for 3600 rpm operation are now being built in sizes 15 times as large as they were only 15 years ago.

Retired engineers could occasionally be called to serve as utility representatives on industry committees if their successors are too busy to leave their jobs. There might, however, be problems of compensation, liability, social security.

Arresters on the transformer side of primary fuses result in no more fuse-blowing than with the arrester on the line side but lead to 50% more transformer failures.

STATISTICS



Output Week Ended March 29—7,263,009,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Mar. 29	+7.3	+4.4	+7.2	+5.8	+7.4	+11.9	+18.7	+6.6	+6.5	−2.9
Mar. 22	+7.4	+5.3	+6.8	+4.6	+7.5	+10.0	+18.2	+7.3	+6.9	+5.5
Mar. 15	+7.4	+4.6	+6.1	+4.0	+7.3	+ 9.6	+17.8	+8.6	+4.8	+11.9

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Jan.	69.0*	70.5	63.4
Capacity (Million Kw)	Jan.	75.97	75.54	69.10
Production (Billion Kwhr)	Jan.	34.20	33.14	31.42
Hydro		9.90	9.13	8.88
Fuel		24.30	24.01	22.54
Fuel Consumption				
Coal (Million Tons)	Jan.	9.87	9.60	9.62
Oil (Million Barrels)		6.07	6.29	6.42
Gas (Billion Cu Ft)		52.27	52.72	43.58
Sales (Billion Kwhr)	Dec.	28.44	27.92	26.07
Residential		7.95	7.37	7.01
Commercial		4.77	4.68	4.29
Industrial		13.74	13.89	12.92
Other		1.97	1.97	1.86
Net Income Class A & B Utilities ($ Million)	Dec.	100.82	70.81	84.83
Estimated Dec. 52 Peak (Million Kw)	Dec.	81.1	80.7	75.3
Kwhr per Residential Customer (12 Month Average)	Dec.	2,004	1,988	1,830
Revenue per Kwhr Residential Service (12 Month Average)	Dec.	2.81¢	2.82¢	2.88¢
Canadian Production (Billion Kwhr)	Jan.	5.27	5.11	4.67

Business Statistics

FRB Industrial Production Index†††	Feb.	215*	215	217
Gross National Product Annual Rate ($ Billion)	4th Qtr.	333.0	327.6	303.7
E. W. 5 Industry Production Index	Feb.	124.8	124.4	119.7
ENR Construction Cost Index††	Mar.	115.4	115.1	112.8
BLS Consumer's Price Index	Jan.	189.1	189.1	181.5
NEMA Insulation Materials, Sales Index†	Dec.	466	511	564
NEMA Electric Appliance Sales Index†	Dec.	218	269	364
NEMA Household Refrig. Sales Index†	Dec.	115	87	219
Metal Prices				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.19	.19	.17
Zinc, prime Western E. St. Louis, lb		.19½	.19½	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.34
Aluminum, ingot, base price		.19	.19	.19
Nickel, base price		.56½	.56½	.50½
Steel, billets, Pitts., ton		56.00	56.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

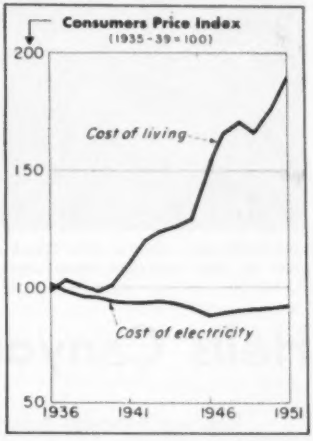
* Estimated † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Housewives Help Build Consumers' Price Index

Changes in prices paid for goods and services usually bought by moderate-income families in large cities are reflected by the Consumers' Price Index, which the Labor Department's Bureau of Labor Statistics issues from month to month.

Such changes are measured by the rate of price movement of a representative list of items of specified quality. The rate of price change is one of the most important factors affecting the cost of living, and over short spans of time, this index gives an acceptable approximation of changes in the cost of living for urban workers.

Part-time agents (usually housewives, school teachers, and ex-



Government employees) collect food prices monthly in their communities.

Most of the price collection for other items is done by full-time bureau representatives. Electric-power rates are obtained from the Federal Power Commission.

The sample of items priced consists of 49 foods, 58 articles of clothing, 10 fuels, 23 house furnishings, 49 miscellaneous goods and services, and rent. The items selected to represent all goods and services purchased were those which were relatively important in family spending, which had distinctive price movements, and which were highly representative of larger groups of related items.

SURVEYORS point transit at Hells Canyon site. Controversial dam would be built at point where river seems to disappear. There canyon walls rise sharply for 2,000 ft above river bed, then more gradually for another 4,000 ft. Floor is only 280 ft wide

Hells Canyon: The Debate Is Heated

Raucous hearings before a House subcommittee prove only that Reclamation's dam won't be started this year

Rowdy hearings on the controversial $356 million Hells Canyon Hydroelectric Project drew to a close last week as a house interior subcommittee heard witnesses for and against the bill.

During the seven-hearing session, committee members indicated by their questions that the bill didn't have a chance. Although no committee decision is expected for some weeks, it is now mainly a question of how the bill will be killed for the session. Even proponents concede it has almost no chance of full Congressional approval this year.

Trial Balloon . . . Main purpose of this year's hearing was to test the feeling of Congress on the bill and to make a public record for use in the future.

At issue is whether Reclamation Bureau can get Congressional approval to build a power dam in the Grand Canyon of the Snake River in western Idaho with a 602 ft head. Idaho Power Co has offered an alternative that would permit it to build five run-of-the-river dams and power houses on the Snake at and near the Hells Canyon site.

Not since the members of the House Public Works Committee went at each other's throats on the St. Lawrence Seaway bill last year have there been such spirited sessions. Lead-off witness was Interior Secretary Oscar L. Chapman, who gave his own and President Truman's blessings to the project. His direct testimony consumed less than 15 minutes. Then committee members conducted a grueling cross examination that lasted three hours.

The questions brought out the fact that water from the project could not be used for irrigation purposes, but Chapman and his Reclamation Bureau pointed out that power revenues from the project could be used to finance other reclamation projects nearby.

For a CVA . . . Under cross examination, Chapman also said he favored "some kind" of Columbia Valley Authority, but not necessarily one similar to the Tennessee Valley Authority. He said he believed power from Hells Canyon should be distributed under terms of the preference clause, but that a certain portion should be reserved for use in Idaho.

The Hells Canyon controversy boils down to the old high dam-low dam argument between public and private power. In this case, the question to be decided is:

One High Dam . . .

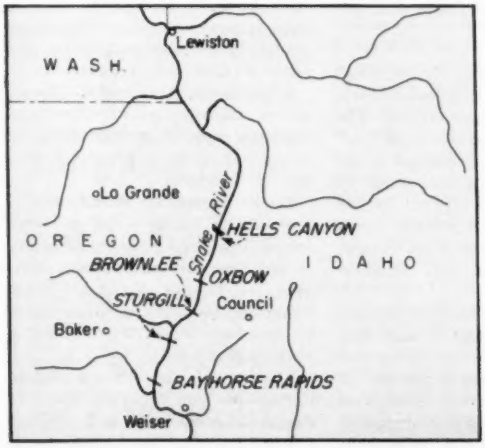
One, says Reclamation, because:

- It would produce a total of 1,124,000 kw of prime power needed for national security in the long range and for the continued growth of the Pacific Northwest. Of the total, an average of 688,000 kw would be produced at the site during reservoir drawdown, and 436,000 kw at existing and proposed downstream dams of the federal government.
- Although cost of construction would be $356,810,000, cost per annual kilowatt would be $17.28 compared with about $20.9 for the five-dam plan.
- The high dam would create a 93-mile-long reservoir of 4.4 million acre-ft, and thus provide important benefits of flood control, navigation, and recreation. Private plan would include neither flood control nor any navigation benefits.
- Surplus power revenues would be used to provide substantial financial assistance for development of needed irrigation throughout eastern Oregon and southern Idaho. Under reclamation law, this irrigation could not otherwise be undertaken. Future upstream benefits would be fully protected.
- By providing power at low cost, Hells Canyon would stimulate business, agriculture and the metallurgical and chemical industries of the area. It would also make possible expanded production of badly needed fertilizer through development of the enormous phosphate deposits in Idaho.
- The project is a major element of the coordinated plan for comprehensive development of land and water resources of the Columbia River Basin prepared by the Department of Interior and Department of the Army.

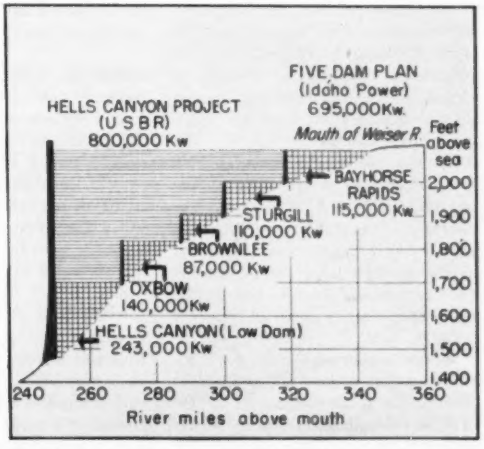
. . . or Five Low Dams?

Five, says Idaho Power, because:

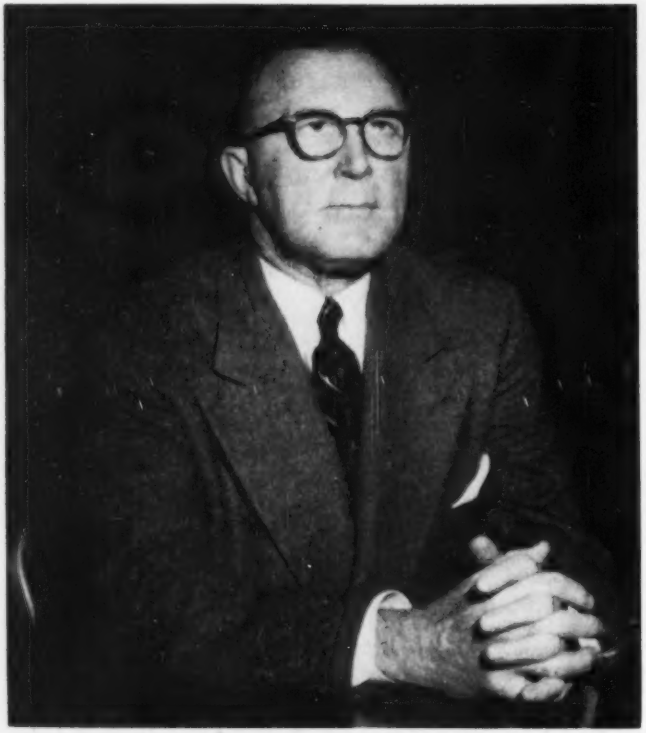
- The run-of-river plants would produce 530,000 kw of firm power. Integrated with the company's system, the project would produce more kwhr than the high dam, because of the government's plan to use Hells Canyon as a river-regulating dam. If national defense demands it, the dams could be built in two to three years, compared with six to ten for the federal plan.
- Construction cost of the five dams would be $176 million, financed completely by private capital. This is about half the cost of the federal dam. Project would pay about $3 million property taxes annually to Oregon and Idaho.
- Project power would not be drained off to coastal areas, but would be used to meet the needs of the Snake River Valley.
- The federal dam would drown out Idaho Power's five hydro sites, including that at Oxbow, which the company has owned for 35 years.
- Low-head dams would create better recreational facilities, and would not produce unsightly mudbanks caused when the high-dam reservoir is drawn down.
- Idaho public opinion strongly favors private development of the Snake. Resolutions opposing the high dam have been passed by the state's Grange, Farm Bureau Federation, Wool Grower's Association, Mining Association, Press Association and others.
- Federal construction of Hells Canyon Dam would be the back-door route to a Columbia Valley Authority akin to TVA. CVA would be a socialistic scheme of federal agencies to take over all future power developments in the Pacific Northwest.



PROJECTS straddle Oregon-Idaho line upstream from Columbia River



COMPARISON of plans shows installed capacities at proposed dams



ANGRY because President "changed the plan" agreed on to settle steel dispute . . .

Charlie Wilson Quits

Mobilization Director favored "package" deal in steel; Truman did not—nationwide strike hangs in the balance

A casualty of the steel dispute—and a serious one—was the loss last week of Charles E. Wilson as director of defense mobilization. Wilson resigned after he and President Truman disagreed over a formula for settlement of the dispute.

Truman accepted the resignation immediately and designated Presidential Assistant John R. Steelman to take charge of mobilization until the steel controversy is ironed out. It looked as though he'd have trouble getting another business man to accept the post after that, because of Wilson's troubles.

Wilson had weathered the job since his resignation as president of General Electric Co in December, 1950. He had the unusual distinction of receiving far more praise than blame while serving in a top government job, and it's at least doubtful that a successor would fare as well.

Looks Like a Strike . . . In Washington early this week it appeared that a steel strike was almost inevitable. The dispute had narrowed to a single issue: whether or not the government would okay a single-package steel price increase of something between $5 and $10 a ton, to become effective simultaneously with the steel wage increase recommended by the Wage Stabilization Board.

It was clear that President Truman was opposed to any such arrangement. That was pointed up sharply by Wilson's resignation. Wilson thought the steel companies deserved advance assurance of a price increase to go with their acceptance of the WSB wage proposals and that he had the President's backing in offering them one. The President made it clear he would permit no government guarantee of a price increase.

Backs Steel . . . But Wilson's resignation backed up the steel makers in their determination not to sign up for a wage increase without assurance of a price boost. Industry representatives were negotiating with union officials, but nothing was expected to come of the sessions. There wasn't a chance the steelworkers would take a penny less than the increase called for by the WSB recommendations. Wilson reportedly was proposing to offer steel makers $4 a ton. The industry will not settle for less than about twice that.

Truman Decision . . .

. . . will bring changes, but won't give public power a whole new look

President Truman's decision to stay out of this year's presidential race will give little comfort to those who oppose public power. In the Democratic ranks, public power candidates are still four or five deep.

The decision does, however, bring the prospect of two shifts on the Washington scene which may affect the future of electric utilities:

- End of the 20-year Roosevelt-Truman regime will probably mean a large turnover of top government personnel.
- Truman appointees may experience more difficulty in obtaining Senate confirmation now that Democratic candidates will want to hold the jobs open for their own nominees.

In any event, these possible changes are of relatively minor importance compared with those that would be brought about by a Republican victory in November.

If the Democrats should win, a new cabinet lineup would probably follow. This could mean the departure of such aggressive public power advocates as Interior Secretary Oscar Chapman. But there is no guarantee his successor would be any less a public power man.

Makeup of the Federal Power Commission and Securities and Exchange Commission will change slowly because of overlapping terms of commissioners and the President.

House Cuts Federal Power Funds

President Truman's federal power budget was having rough going last week as the House prepared to work on the last of the big money bills for the various power projects.

Still aiming at a July adjournment, the legislative session supposedly was at about the halfway mark. Of the bills carrying money for power projects, only the Army civil functions bill was still to be approved by the House. All bills now go to the Senate for consideration.

As in the past few years, the House Appropriations Committee and the House, itself, approved a number of deep cuts in the President's power budget. Overall, the House approved cuts totalling about 21% in the Interior Department appropriations bill, more than 30% in construction funds of the Army Corps of Engineers, and about 15% in funds for the Tennessee Valley Authority (See table).

Here is a run-down on appropriations actions thus far:

Army Corps of Engineers . . . Following heavy cuts by its Appropriations Committee, the House last week was prepared to begin consideration of the Army civil functions bill, which contains funds for a number of multipurpose waterway projects. Already the committee has recommended deleting funds for several large projects which would contain electric power features. Among these are the Hartwell Dam in Georgia and South Carolina, Ice Harbor Lock and Dam in Washington, the Dalles Dam in Oregon, and Gavins Point Reservoir in Nebraska. A request of $1 million for planning power redevelopment at Niagara Falls was disallowed.

There will probably be attempts to restore funds for one or two of these items as the House debates the bill.

TVA Units Cut . . . By a 199-to-159 vote, the House acted to delete funds requested for addition of four large generating units at TVA's Shawnee steam plant. TVA has requested about $28 million to be spent in fiscal 1953 for these units. In this instance, the House went beyond the recommendations of its Appropriations Committee, which had proposed funds for two of the four units.

Interior Department Agencies . . . The House went along with its Appropriations Committee in the following actions on the Interior funds bill:

- Elimination of the $50,000 requested by the department for power and energy studies in New York and New England.
- Elimination of all construction funds for the Southeastern Power Administration except $869,500 for the Clark Hill-Greenwood transmission line, which is already under construction, and $90,000 for planning future programs. For purchase of power, use of wheeling facilities, maintenance and general operations, the House allowed Sepa $495,000.
- For Southwestern Power Administration, the House approved the full $4.15 million requested for construction. However, SPA's request for a continuing fund of $1.5 million was cut to $231,000.
- Bonneville Power Administration was denied $1,173,000 it had requested for construction of the Baker-La Grande transmission line and about $900,000 for substation and switching facilities at Klamath Falls, Ore., which was planned as a part of the Bonneville-California intertie. Approval was given for the $2.6 request to begin construction of a 230-kv transmission line from McNary Dam to Walla Walla, Wash.
- From Reclamation Bureau requests, the House deleted funds for the Bonneville-California intertie and also an item of some $60,000 requested for a substation for the Tracy-Contra Costa, Clayton-Ygnacia system transmission lines. Reclamation was also denied money for lines and substations to serve Camp Stoneman in California.

No Money for Lines . . . Also turned down by the House were requests for more than $5 million to begin construction on three Missouri River Basin project transmission lines. These were the Yellowtail-Billings line, the Sioux City-Omaha line, and the line through southwestern Minnesota.

The Keating amendment which restricts construction of transmission lines by the Bureau of Reclamation was again written into the funds bill.

Independent Agencies . . . Nor did the regulatory agencies escape the House economy axe. Securities and Exchange Commission asked for $5,950,000 for fiscal 1953. The House cut this to $5,245,080. Federal Power Commission asked for $4,540,000. The House allowed only $3,935,000.

Truman's Fiscal 1953 Power Budget at the Halfway Mark

Federal Agency	(Millions of Dollars) Construction Funds Requested	Allowed by House Committee	Approved by the House
Southeastern Power Administration	$ 6.35	$ .96	$ .96
Southwestern Power Administration	4.15	4.15	4.15
Bonneville Power Administration	70.29	66.52	66.52
Reclamation Bureau	194.72	153.35	153.35
Army Corps of Engineers			
Rivers and harbors	208.69	117.71	No action
Flood control	287.32	206.02	No action
TVA (total funds)	200.03	185.27	171.27

Committee Gives Up Asking About Intertie

Interior Department has apparently won its fight to withhold information from the House Appropriations Committee concerning the proposed Bonneville-California intertie.

For the past two years, the committee has demanded a report on work done by departmental agencies in planning the controversial intertie. No report has ever been made.

Nevertheless, the committee in acting on Interior funds requests this year, made no reference to its past demands.

ON HAND to get the first American Power Conference underway were (l to r) J. B. Thomas, president, Texas Electric Service; E. J. Doyle, vice chairman, Commonwealth Edison; Mayor M. H. Kennelly of Chicago; Major Lenox Lohr, Museum of Science and Industry, Chicago, and president of Centennial of Engineering; G. M. Gadsby, president of EEI and Utah P&L; and C. H. Lang, GE vice president

Continued Growth of Power Load Seen

Speaker at first American Power Conference predicts five trillion kwhr will be produced yearly by 2000 A. D.

"Proof of the electric industry's progress lies in the fact that we increased production one eighth as much in 1951 as in the previous 36 years," George M. Gadsby, president of Edison Electric Institute and Utah Power & Light Co, told the first American Power Conference, held in Chicago March 26-28.

The conference was attended by more than 2,500 of America's leading engineers. Sponsored by Illinois Institute of Technology, it replaces the Midwest Power Conference.

In his address, Gadsby paid tribute to the "almost incredible activity of the electrical industry since Korea and the creative genius of the American people despite controls rather than due to them."

He said the most serious problem resulting from the industry's growth is the increasing need for engineers in the face of an alarming decrease in engineering graduates.

Personnel Problem . . . In a similar vein, Pressly H. McCance, president of the Association of Electric Illuminating Companies and Duquesne Light Co, said, "We must look ahead very carefully to the sources of new personnel—engineers, salesmen, accountants, linemen, substation and power station operators, and in fact people for almost every job classification. The growth we see ahead will require major changes in our organization: upgrading, training, job orientation, realignments of work and responsibility."

5 Trillion Kwhr . . . Output of 5 trillion kwhr per year by the year 2000 was forecast by Chester H. Lang, vice president, General Electric Co. Lang said, "It is now a practical certainty that by 1960 the 1950 output will be almost doubled to 540 billion kwhr. Perhaps" he continued, "we will not even have to wait another ten years thereafter to attain a trillion—it may come by 1965."

The same trends in the growth of electric power loads were foreseen by Philip Sporn, president of American Gas & Electric Co. In commenting on the electrical system design requirements for this growth period, Sporn said, "Anyone can make engineering economic studies, but it takes an engineer with vision to know what to do with them." This vision, he said, can only be acquired through broad interests and understanding.

"Firm power from the Missouri Valley development will be surprisingly small; so small that it will be of little assistance in meeting the needs of the future," declared N. Bernard Gussett, president of the Iowa Power & Light Co, Des Moines, Iowa.

Reheat Accepted . . . "With 19 million kw of reheat turbines on order, or installed, the use of reheat has been accepted," T. R. Carlson, Westinghouse Electric Corp, stated. Steam conditions are advancing to 2,800 psig 1150 F, 1100 F.

Present-day mechanization of distribution construction equipment, as discussed by J. C. Strasbourger, of The Cleveland Electric Illuminating Co, included: (1) hydraulic grading, (2) pavement cutter for up to 17 in. thickness, (3) the "sky lift" for raising linemen and mechanized tools to position for work on pole, (4) railroad cranes for setting poles, (5) hydraulic crane for work in congested areas and, (6) multibodied truck, used like a dump truck but equipped to leave empty box on job while full box is being emptied.

Probably 90% of all surface condensers in operation are not performing as well as they should, said G. H. Putnam, manager, condenser department, Ingersoll-Rand Co. In fact, he stated, in many cases, the deficiency in performance is almost deplorable.

Intakes . . . Intake model tests were described by W. W. Wiltmer, Allis-Chalmers. A test flume was built above the shop floor with windows for flow observations. The flow was followed by injecting finely divided

air into the water. Observation of what was happening around the suction bell was especially desired, past observations having been limited to the water surface.

In the research, Wiltmer said, the aim was to formulate general design procedures for intakes. So far, all test work has been on specific installations and numerous intake problems have been solved through the model tests, he commented.

Steam generation design has been directed largely toward accomodation of poorer fuels with no penalties in economy and improvement in cycle efficiency, H. B. Wallace, Jr, Foster Wheeler Co, said.

Insulation Levels . . . Basic insulation levels of transmission systems can be reduced, on the basis of operating experiences, and such reductions will materially affect the economy of the industry, H. L. Rorden, Bonneville Power Administration, told the transmission meeting. High speed reclosers at both ends of transmission lines on the Bonneville system restore service rapidly enough to maintain system stability, he said.

Lower conductor tensions permit more economical structure designs, Rorden reports. System studies show tha loads in excess of 400 mva per circuit must be considered for circuits over the Cascade mountain passes and these in turn indicate voltages of 345 kv or higher, he said.

Avoiding noises that may annoy neighbors can be accomplished by manufacturers by modification of the design of power plant, substation and other utility system equipment and by design engineers through the use of acoustical devices and materials to dissipate noise and vibration, W. F. Friend of Ebasco Services Inc said.

Gas Turbines . . . Gas turbines in fully developed and tried-out designs are now available in sizes from 1,200 to 7,000 kw, Paul R. Sidler, president, Brown Boveri Corp, said. Gas is ideal fuel but reliable service can be obtained with heavy fuel oils. Efficiencies of 17% with inlet gas temperatures as low as 112 F are available.

A 15,000-kw gas turbine with a 6-to-1 air compression ratio is now being manufactured by Westinghouse for service on the Public Service Co of Oklahoma system, J. O. Stevens, Westinghouse, stated. This unit is expected to match the economy of a steam plant of 850 psi, 900 F with four stages of reheating.

HONORARY DOCTOR of Engineering degree is conferred upon Alex D. Bailey (center), former vice president of Commonwealth Edison Co, by Dr John T. Rettaliata, president of Illinois Institute of Technology. James D. Cunningham, chairman of Illinois Tech's board, looks on. Presentation was made at the All Engineers Dinner of the American Power Conference

Proposes Rating Changes . . . Changes in the method of rating high voltage circuit breakers were proposed by C. L. Killgore, Bureau of Reclamation, who said that rating on the assymetrical wave would be more realistic than the present method of symmetrical wave ratings. He stated that breakers are supposed to interrupt an assymetrical wave if tested on a symmetrical wave fault but positive proof on this is not available.

Lignite is a satisfactory power plant fuel, Alex Burr of the U. S. Bureau of Mines told the conference. It is being used both for stoker and pulverized fuel firing and experiments have shown that by increasing temperatures of gases it can be burned successfully in the cyclone furnace.

Larger conductors can be economically justified on transmission systems, R. M. Butler, General Electric said. Benefits enumerated were: lower I^2R losses; lower reactive correction needed to maintain good voltage at the loads; lower transformer capacity requirements; and heavier loadings per circuit, with proper system design, at less cost per kwhr delivered. Methods of calculating most economical conductor sizes were shown.

Survey Results . . . Surveys of the water steam cycles at each of three stations before and after ammonia was fed into the cycle indicated that the addition of ammonia resulted in a decrease in copper and iron pick up, F. L. Archibald, Boston Edison Co, reported.

After extensive tests it was concluded that the acid deaerator produces water containing substantially zero carbon dioxide. Modifications of ASTM tests were devised to make this determination.

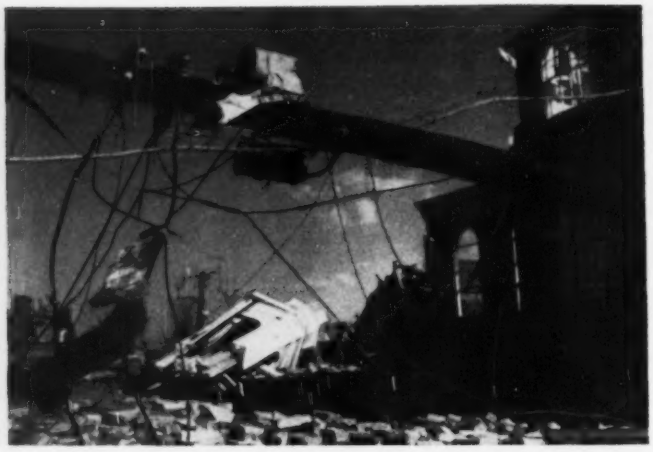
Development of fluid drives for 1,800 to 2,000 hp, 3,600 rpm units for boiler feed pumps and mechanical draft fan drives was described by Ben Ragland, American Blower Corp. Acceptance of the principle and performance of these units for stepless speed controls of adjustable speed drives, he said, is indicated by the long list of installations made since the war.

Load Research . . . There is a real need for more load research, said C. M. Turner, Cincinnati Gas & Electric Co. He urged utilities to study the load characteristics of their systems and those of their individual customers.

Effect of refrigerators, ranges, water heating, electric space heating and heat pumps on load characteristics were discussed. The opportunity for load research is endless, Turner stated, and is particularly needed in the cases of television, clothes dryers, and dehumidifiers and on rural lines.

J. E. Whitwell, Philadelphia Electric Co, said load research, as it provides additional market knowledge, is important in load building operation.

ACETYLENE TORCH is used to cut up steel structure at substation mangled by storm



DISTRIBUTION POLE and tangled wires frame fallen steeple of church at Judsonia, Arkansas town leveled by tornadoes. Arkansas P&L's distribution system in the town was wiped out

CREWS are ready to "lay up" conductor on line between Price substation and Searcy

Repairing the Damage

Arkansas Power & Light Co undertakes the task of putting its system back into shape after destructive tornadoes

The tornadoes that struck the Midwest March 21-22 wrought their destruction in a relatively short time. The job of repairing the damage will take much longer.

Arkansas Power & Light Co, which suffered a $500,000 loss as a result of the storm (EW, March 24, p 10) has started to patch up its system. In some cases it will be necessary to rebuild the installations completely.

In an effort to restore service to its customers as quickly as possible, the utility made many temporary repairs.

The company is expected to request additional controlled materials from Defense Electric Power Administration for permanent restoration of damaged facilities.

LINEMEN build temporary wood structure to bring 115-kv line to Bald Knob substation

STEEL STRUCTURES at Arkansas P&L's Price substation near Searcy were wrecked by twisters. Workers had to build temporary wood H-frame structure to get circuit into transformer

FINANCIAL

'Built-In' Economies Help . . .

. . . electric utility industry to expand despite increased taxes and a general increase in utility costs of 110% since 1940

"Built-in" economies are keeping the electric utility industry in business and even enabling it to expand in the face of increased taxes and rising costs, the American Society of Mechanical Engineers was told recently at its spring meeting at the University of Washington.

All utility costs have increased markedly, some three or four times as much since 1930, while the general increase since 1940 is 110%. Wallace L. Chadwick, vice president in charge of engineering and construction, Southern California Edison Co, Los Angeles, and Edwin H. Krieg, consulting engineer, Stone & Webster Engineering Corp, Boston, Mass., declared in a jointly prepared paper.

Ingenuity Required . . . To remain in business without raising electric rates in the same proportion as rising costs has required the utmost ingenuity in engineering, design and construction of generating plants to continually lower fuel consumption while providing higher availability with lower operating and maintenance costs, they said.

"The four most important elements in the cost of energy are taxes, fuel, capital, and labor," they declared. "In 20 years, taxes of electric utilities in Southern California have jumped from about 1.5 mills per kwhr to almost 4.0 mills at present. Fuel oil costs, during this period, have climbed two to three times.

"Dump Gas" Higher . . . "With 'big inch' and 'super-inch' lines now carrying natural gas to big population centers for heating, the cost of this fuel is rising rapidly. Even the cost of 'dump gas' is increasing. In a few cases, such as those where strip mining and water transportation are possible, coal costs have decreased but most operators find them materially higher.

"Construction and material costs have advanced along with the marked increase in the cost of all labor. Construction wage rates, with related pay roll taxes and the new fringe costs, have soared about 4.5 times since 1930. The cost of materials and equipment has climbed along with labor.

"Operating labor costs have increased along with construction labor costs. Although the average rate for money is appreciably lower than 20 years ago, so much more is now required for a given job that the benefit of lower money rates is largely lost. Yet, without being able to raise electric rates to offset these costs as they rise, the industry must raise more capital in less time than ever before—currently, more than two billion dollars a year for new facilities."

Public Financing Curb Dropped by Credit Group

The voluntary credit restraint program, as it affects financing by state, municipal and other public bodies, has been scrapped on orders of President Truman.

One of the immediate effects of this action is to open the way for seven Washington State PUD's to acquire the Puget Sound Power & Light Co. Previously the Western Investment Banking Voluntary Credit Restraint Committee had turned thumbs down on PUD-proposed financing of the deal.

NVCR Issues Directive . . . At a meeting in Washington early last week, the National Voluntary Credit Restraint Committee directed its regional committees to suspend screening financing proposals of public bodies. The directive was sent as a result of a letter from President Truman to former Defense Mobilizer Charles E. Wilson, who relayed it to the National VCR group.

In asking that public financing be exempted from VCR scrutiny, Truman indicated that he did not believe state and local governments should be required to submit their proposals to committees made up of private bankers and others in the private financial field for advice as to whether the financing should be undertaken during the present emergency.

Effect on Puget Sound P&L Deal . . . While the VCR action does have a direct and immediate effect on the Puget Sound deal, there are a number of other state and local financing proposals that have been held up by VCR decisions. However, strong pressure was brought to bear by Washington state legislators to limit the authority of the VCR program.

Sen Warren Magnuson, Washington Democrat, had opposed amendment of the Defense Production Act to exempt public financing from VCR restrictions. This proposal is no longer needed now that the President has removed restrictions by direct action.

FINANCIAL BRIEFS

New England Electric System stockholders of record May 8 will have the right to subscribe to 920,573 common shares on a 1-for-8 basis to expire May 26. The offer is subject to regulatory approval. Competitive bidding will set the offering price and underwriting commission.

President Truman has nominated Clarence H. Adams, Bloomfield, Conn., to be a member of the Securities and Exchange Commission.

Carolina Power & Light Co has asked the North Carolina Public Utilities Commission and the South Carolina Public Service Commission approval to issue and sell 50,000 shares of $5 preferred stock to institutions at $107 a share and sell 200,889 shares of common stock to the public through Merrill Lynch-R. S. Dickson & Co group, underwriters . . . **Texas Electric Service Co** plans to sell $8 million bonds and $5 million debentures.

REGULATION

Seattle City Light Plant Superintendent Eugene Hoffman said that no increase in rates is contemplated. He made the statement as result of declarations in the city election campaign that City Light rates are due for an increase.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
March 27	**2.95**	**2.99**	**3.13**	**4.11**	**4.29**	**4.66**	**5.35**	**6.03**	**6.47**
March 20	2.96	3.00	3.14	4.15	4.32	4.68	5.33	5.94	6.49
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months	Ended	Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
Middle South Utilities, consolidated	12	Feb.	11,105,284	10,530,582	$1.84	$1.88
Southern Co, consolidated	12	Feb.	17,916,512	15,918,658	1.11b	1.04b
			1951	**1950**	**1951**	**1950**
California Electric Power	12	Dec.	$1,605,833	$1,768,888	.54a	.71a
Central Illinois Public Service	12	Dec.	4,866,510	5,162,755	1.45b	1.71b
Consolidated Edison Co of N. Y.	12	Dec.	29,211,827	39,206,625	2.26	2.44
Duquesne Light	12	Dec.	12,827,540	11,726,253	1.99	1.82c
Houston Lighting & Power	12	Dec.	6,972,517	6,612,922	1.40	1.35e
Middle South Utilities, consolidated	12	Dec.	10,942,965	10,191,457	1.81b	1.82b
North American, consolidated	12	Dec.	10,806,000	12,622,000	1.26	1.47
Ohio Edison	12	Dec.	12,485,649	12,977,879	2.60b	2.98b
Pennsylvania Electric	12	Dec.	6,596,927	6,683,510	3.14	3.53
Rochester Gas & Electric	12	Dec.	3,375,927	3,522,731	2.34a	2.84a

NOTE—The figures shown for the last ten companies have been audited.
a—On average number of shares outstanding; b—On shares outstanding at end of each period; c—In terms of stock as reclassified in 1951; and e—After giving effect to 3-for-1 stock split in 1951.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF MARCH 27 TO APRIL 2			
Bonds			
Texas Power & Light—1st mtg 3¼% 1982	$14,000	101.25%	3.19%
Texas Power & Light—debentures 3⅜% 1977	5,000	101.25	3.30
West Penn Power—1st mtg 3¼% 1982	12,000	101.931	3.15
San Diego Gas & Electric—1st mtg 3¼% 1982	12,000	101.75	3.16
Interstate Power—1st mtg 3⅜% 1982	2,000	101.682	3.41
Common Stock			
Portland General Electric—250,000 sh	$6,938	$27.75	6.49%
Texas Utilities—409,689 sh (being offered to commonholders on 1-for-12 basis (a), record March 5 to expire March 28)	13,315	32.50	5.17
Central Louisiana Electric—53,616 sh (being offered to commonholders on 1-for-7 basis (a), record Feb. 25 to expire Mar. 31)	1,582	29.50	6.78
Interstate Power—345,833 sh (being offered to commonholders on 1-for-6 basis (a), record April 2 to expire April 18)	2,991	8.65	6.94
WEEK OF APRIL 3-9			
Bonds			
Consumers Power—1st mtg 1987	$25,000	.....	.....
Omaha (Nebraska) Public Power District—electric rev 1954-1982	17,000	.....	.....
Common Stock			
Colorado Central Power—17,308 sh (being offered to commonholders on 1-for-11 basis, record March 5 to expire April 7)	273	$15.75	6.35%
SCHEDULED FOR APRIL			**Bid Date**
Bonds			
Wisconsin Power & Light—1st mtg 1982	$7,000	.....	April 15
Alabama Power—1st mtg 1982	12,000	.....	April 22
Union Electric Co of Missouri—1st mtg 1982	30,000	.....	April 29
Preferred Stock			
Wisconsin Power & Light—15,000 sh (being offered to preferred stockholders, record March 31 to expire April 21, subject to allotment in the case of oversubscriptions)	$1,500	.....	*
Common Stock			
Indianapolis Power & Light—196,580 sh (to be offered to commonholders on 1-for-7 basis (a), record April 10 to expire April 24)	.....	.....	.....
Wisconsin Power & Light—288,208 sh (being offered to commonholders on 1-for-7 basis, record March 31 to expire April 21)	.....	.....	.....
Southern California Edison—800,000 sh	.....	.....	*
Gulf States Utilities—300,000 sh	.....	.....	April 22
Tucson Gas Electric Light & Power—140,000 sh	.....	.....	April 22

* Depending upon market conditions, offering by First Boston-Harris Hall & Co group, underwriters expected during the week of April 14.
a—Stockholders are allowed oversubscription privileges.

CALENDAR

Illuminating Engineering Society
Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla., April 6-8; Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22; Canadian National Conference, Hotel General Brock, Niagara Falls, Ontario, Can., April 30-May 2; Great Lakes Regional Conference, Hotel Statler, Cleveland, Ohio, May 5-6; East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Southeastern Metermen's Association
Meter Conference, University of Florida, Gainesville, Fla, April 7-11.

American Institute of Electrical Engineers
Southwest District Meeting, Jefferson Hotel, St. Louis, Mo., April 15-17; Welding Conference, Rackham Memorial Bldg., Detroit, Mich., April 16-18; arranged jointly by American Welding Society, Detroit Section, and Industrial Electrical Engineers Society, Detroit; Northeastern District Meeting, Arlington Hotel, Binghamton, N. Y., April 30-May 2; Summer General Meeting, Hotel Nicollet, Minneapolis, Minn., June 23-27.

Pacific Coast Electrical Association
Administrative Services Section Conference, Hollywood-Roosevelt Hotel, Hollywood, Calif., April 17-18; Business Development Section Conference, Hotel Huntington, Pasadena, Calif., April 24-25.

★**Pennsylvania Electric Association**
Spring Meeting, Meter Committee, Hotel Yorktowne, York, Pa., April 17-18; Communications Committee, American Hotel, Allentown, Pa., May 1-2; Spring Meeting, Relay Committee, Lawrence Hotel, Erie, Pa., May 8-9; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 15-16; Spring Meeting, Systems Operation Committee, Allenberry Lodge, Boiling Springs, Pa., May 22-23; Spring Meeting, Transmission-Distribution Committee, Iron Temple Country Club, Dallas, Pa., May 22-23; Spring Meeting, Prime Movers Committee, Tidewater Inn, Easton, Md., May 28-29.

Rocky Mountain Electrical League
Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 20-22.

★**American Wood-Preservers' Association**
Annual Meeting, Hotel New Yorker, New York, April 21.

Southeastern Electric Exchange
Annual Conference, Boca Raton Hotel, Boca Raton, Fla., April 21-23.

American Public Power Association
Spring Convention, Hotel Olympic, Seattle, April 29-May 1. Joint Meeting with Northwestern Public Association, April 28.

Edison Electric Institute
Electrical Equipment-Prime Movers Committee, Edgewater Beach Hotel, Chicago, May 5-6; Association of Edison Illuminating Companies Meter-Service Committee, Edgewater Beach Hotel, Chicago, May 5-7; Transmission-Distribution Committee, Edgewater Beach Hotel, Chicago, May 6-7; Hydraulic Power Committee, Edgewater Beach Hotel, Chicago, May 6-7; Purchasing Stores Committee, Roosevelt Hotel, New Orleans, La., May 11-14; Accident Prevention Committee, Indianapolis Athletic Club, Indianapolis, Ind., May 22-23.

National Electrical Manufacturers Association
4th International Lighting Exposition-Conference, Industrial-Commercial Lighting Equipment Section, Cleveland Auditorium, Cleveland, May 6-9.

Northwest Electric Light & Power Association
Engineering-Operation Section, Rainbow Hotel, Great Falls, Mont., May 7-9; Business Development Section, Chinook Hotel, Yakima, Wash., May 12-14; Personnel Section, Vancouver Hotel, Vancouver, B. C., May 19-21; Accounting-Business Practice Section, Medford Hotel, Medford, Ore., May 22-23.

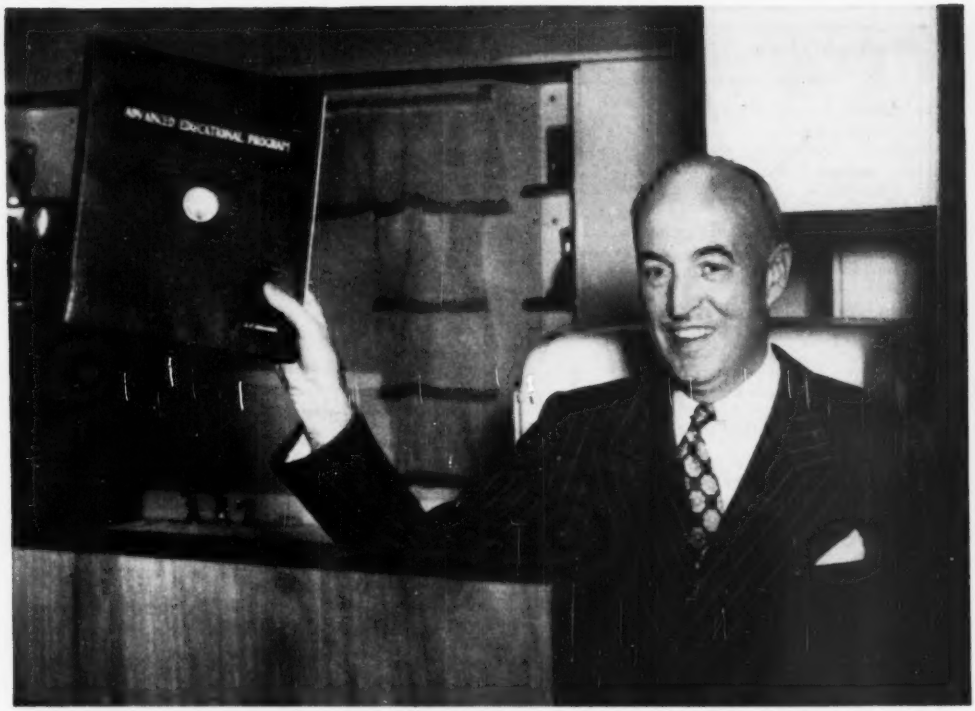
Public Utilities Advertising Association
Annual Convention, Hotel Radisson, Minneapolis, Minn., May 8-9.

★**Interstate Power Club**
Hotel Martinique, New York, May 12.

★**Nashville Electric Service**
1952 Electric Show, Electric Center Bldg., Nashville, Tenn., May 12-17; co-sponsored by Nashville Electrical Dealers Association.

★**New Jersey Utilities Association**
Spring Conference, Seaview Country Club, Absecon, N. J., May 16.

★Addition this week.



F. E. VERDIN, director of personnel, waves one of the special notebooks distributed to each of the 190 students enrolled in Cleveland Electric Illuminating Co's first Advanced Educational Program. Verdin was chairman of committee that outlined and directed the program

CEI Stresses Employee Education . . .

. . . in four programs which range from Advanced Educational Program at college level to Tuition Refund Program which may include correspondence courses or vocational school study

The educated worker is a better worker. Because the management of Cleveland Electric Illuminating Co believes this, the company is conducting an extensive employee education program. Since 1949 over 1,000 employees have participated in some way.

The program, divided into four divisions, is so broad in scope that nearly every employee can improve himself by studying under one or more of the four sections:

1. Advanced Educational Program—This is a college-level course intended as a training ground for supervisors and junior executives. To qualify, an applicant must have a college degree or its equivalent and must meet the standards established by aptitude tests.

2. Employee Self-Improvement Program—This is open to all employees on a first-come, first-served basis. Many employees who are not qualified for AEP are enrolled.

3. Miscellaneous Educational Courses—These are set up whenever a group of employees is interested in one subject, the knowledge of which would improve their value to the company.

4. Tuition Refund Program—This permits any employee to study courses relating to the company's business at the school or college of his choice, or to take a recognized correspondence course and have 50% of the tuition refunded by CEI if he completes the work successfully.

To enroll in any of the programs an employee must first submit his application through his supervisor. Each application is judged on its merits. If the employee can show that the extra study will enable him to do a better job, it is practically always approved.

All evening programs are voluntary. All classwork and studying are done on the employee's own time. The company does not pay the employee anything.

Advanced Educational Program . . . When the Advanced Educational Program was first announced in the fall of 1948, the Employee Development Committee in charge of it was amazed. Over 400 employees applied, far too many for the company's facilities and personnel to handle satisfactorily. It was decided to limit the initial group to 200 or less and to delay the starting date to Jan. 6, 1949.

Advanced Education Program — Course 1

Meeting Subjects and Executive Responsible

Our Company—Its Growth and Prospects . . . . . E. L. Lindseth, President
Company Organization . . . . . F. E. Verdin, Director of Personnel
The Electric Public Utility Business . . . . . R. M. Besse, Vice President
Steam Generating Plants
A. A. Casey, General Superintendent of Steam Power
Tour of A Power Plant
Utilization of Coal in Production of Electric Power
A. A. Casey, General Superintendent of Steam Power
Business Research and Valuation Group
F. W. Brooks, Director of Business Research and Valuation
Tour of Canal Road Plant—Underground Steam System—Canal Road Substation Company Methods and Procedures . . R. H. Smith, Controller
Safety . . . . . Chairman, General Safety Committee
Job Evaluation and Classification . . . . F. E. Verdin, Director of Personnel
Purchasing, Stores, Transporation, and Shops
R. P. Snow, Director of Purchasing and Stores
The Electrical System of the Company, Its Design and Operation
C. J. Beller, General Superintendent of Electrical Operations and Engineering
Investors Relations . . . . . S. L. Hall, Vice President and Secretary
Lines . . . . . W. E. Radar, General Superintendent of Lines
Tour of Substations and Miles and Brooklyn Warehouses
Company's Sales Operations . . . . R. C. Hienton, General Sales Manager
Company's Services and Eastern District Operations
H. T. Sealy, General Superintendent of Services
Public Relations and Advertising . . . F. J. Ryan, Assistant to the President
Union Relations . . . . . F. E. Verdin, Director of Personnel
Story of the Accounting Group . . . . . R. H. Smith, Controller
Future Territory Market . . . . . R. C. Hienton, General Sales Manager
Treasury Group . . . . . P. V. Dopler, Treasurer
Work of the Legal Group . . . . . R. M. Besse, Vice President
Trends in Utility Financing . . . S. L. Hall, Vice President and Secretary
Budgeting Interpretation and Financial Statements . R. H. Smith, Controller
Trends and Forecasts
F. W. Brooks, Director of Business Research and Valuation
Company's Personnel Practices . . . . F. E. Verdin, Director of Personnel
How Government Ownership Affects You . . . R. M. Besse, Vice President

In the meantime, the screening of applicants took place. All applicants, regardless of their rank in the company, were required to take these tests:

1. A 30-minute mental ability test designed to measure the speed and accuracy of a person's thinking.

2. A social intelligence test which measures the following areas: Judgment in social situations, memory for names and faces, recognition of the mental state of the speaker, observation of human behavior, and sense of humor.

3. A personality inventory test designed to measure six areas of personality.

4. A test on vocational interest to indicate in general areas where a person might do his best work.

Of the 401 applicants, the committee selected 190 for the first class, 135 were deferred, and 76 did not qualify. Of the 190 accepted, 64 were supervisors, and 126 were in non-management jobs.

The program was divided into two courses of study. Course 1 covered all departments and their operations as well as their relation to the company as a whole. The success of this course is due to active participation by the top mangement of the company. Supervisory employees were excused from this course because they had been given the material at their monthly management meetings. This course was given every other Thursday from 6 to 8 pm. The list of subjects covered and the company official in charge are listed in the panel on this page.

Course 2 covered subjects leading to personal development. These included: Conference leadership, 10 sessions; fundamentals of electricity, 6; fundamentals of accounting, 6; public speaking, 10; public contacts, 2; human relations,4; business letter writing, 10; and engineering economy, 10.

These sessions were held alternate weeks on Monday, Wednesday, or Thursday from 6 to 8 pm. Participants were divided into nine groups with three meeting each evening. College professors were hired to teach speaking, writing in business, and engineering economy. Qualified company instructors taught the other courses. Any textbooks used were loaned to the students and instructors by the company.

In selecting outside instructors the committee looked for the best talent available on faculties of colleges in the Cleveland area. Among those selected were Russell C. Putnam, professor of electrical engineering; William A. Lynam, associate professor of industrial engineering, and Dr Robert L. Shurter, head of the division of humanities, social studies, language, and literature, all of the Case Institute of Technology. Dr Warren A. Guthrie, head of the speech department at Western Reserve University, and members of his staff taught the public speaking courses.

Badges for Identification . . . Each participant was given a name badge to wear so that instructors and students could become acquainted.

At the request of the students they were graded in accordance with the letter basis used in colleges. These grades were based on written home work, class participation, and examination results. Individual student rating sheets were prepared also by instructors. At the close of the course these were sent to the employee's department head.

The group of 190 which started the course in January 1949 completed it in May 1951. Elmer L. Lindseth, company president, conducted the graduation ceremonies. There were 149 graduates. Military service, other activities, and inability to make the grade eliminated the other 41. During the 29 months 26 of the non-management students were promoted to management ranks.

In September 1949 a second class was started with 205 students. Since 181 were still taking courses with the first class, total enrollment was 386. In September 1950 a third class of 50 was started to push the total to 436.

Of the second class of 205, 127 were around for commencement exercises in November 1951. Of this

group 17 non-management members had been promoted.

It is planned to continue forming new groups in this program as long as there are applicants who wish to enter.

Employee Self-Improvement Program . . . In answer to requests by employers not eligible to enter the Advanced Educational Program, this program was begun in September 1951 with 177 students enrolled on a first-come, first-served basis. Another 291 have since applied. The first classes were held at Cleveland, but since then other classes have been organized at Ashtabula.

There are four courses. An employee can take as many as he cares to. All classes are two hours once a week except the distribution transformer class which meets every other week.

The courses are as follows:

1. The Story of Our Company is similar to Course 1 of AEP—in which top officials of the company participate—20 sessions.

2. How to Express Yourself Orally and in Writing is a course in Business English taught by college instructors—10 sessions.

3. Group Discussion Techniques is a combination of public speaking and conference leadership taught by company instructors and college professors—10 sessions.

4. The Distribution Transformer is a course prepared by Westinghouse Electric Corp for use in electric utility companies. It is a six-session course taught by company instructors.

Upon successful completion of a course, a participant is presented with a certificate indicating that he has completed that course. As he completes additional courses, that information will be entered on the same certificate. Successful completion is based on the instructor's judgment as to class work and attendance. The student is either passed or failed. Information on grades is not released unless the employee requests that his supervisor be informed.

Additional courses will be added to this program if there is an employee demand for them. The program will continue as long as there is employee interest.

Miscellaneous Educational Courses . . . These were started in October 1951 when a group of 67 employees in the Stores Department indicated their interest in "Materials Handling," a course offered by Fenn College. An arrangement was made with the college to provide an instructor for this course which is held in a company conference room. Because of the size of the group, 27 employees were selected to attend 16 weekly lectures of 2 hours duration. The course will be repeated for the remainder of those interested.

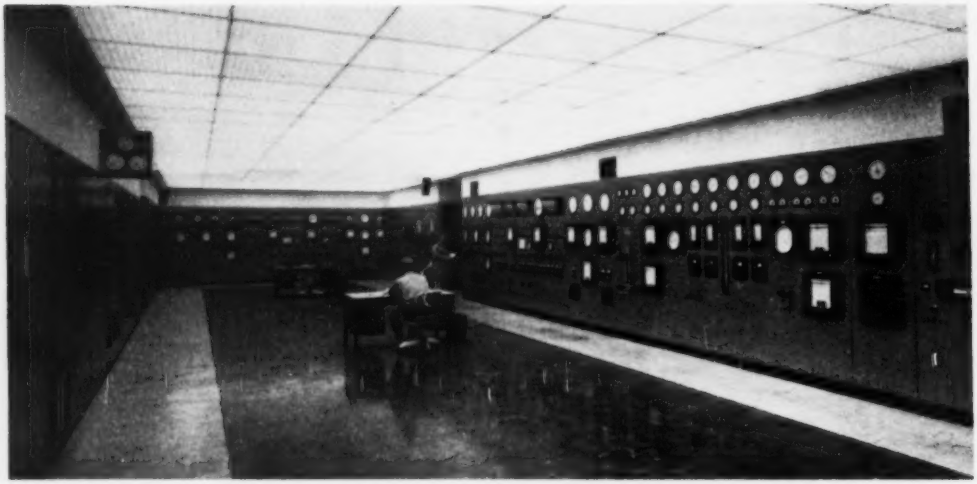
A similar course on the "Chemical Industry" is being presented to Development and Industrial Department salesmen who requested it because of the chemical companies in the area.

OPERATION OF TRANSFORMERS at Ridge Substation is explained to AEP group by Peter Benya. Tours of company facilities and explanations of their operation were important part of AEP

ALL SET TO GO these 190 employees showed up for the first meeting of the Advanced Educational Program on Jan. 6, 1949. But only 149 appeared for commencement exercises in May 1951

Tuition Refund Program . . . Courses studied under this program must be related to the company's business. Usually the course is of college level. However, permission may be granted an employee to take a vocational course in a trade school or a correspondence course with a recognized school provided the course is about the level of beginners' courses in such subjects. The maximum number of credit hours which will be approved for one semester will be six credit hours.

To obtain the 50% refund the student must have passed the course and must be a regular employee at its completion.



CENTRAL CONTROL ROOM showing generator switchboards, boiler, turbine and auxiliary panels. Titus Station, Metropolitan Edison Co

Keep Yesterday's Instruments

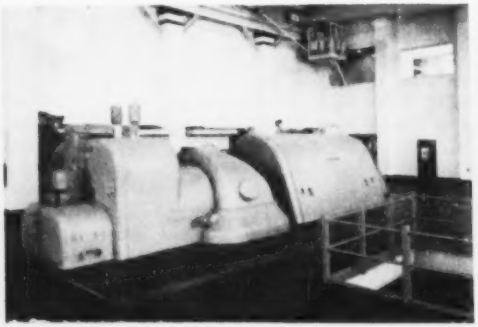
Fast growing trends in steam station design are making new and special demands on instrumentation and control in modern power plants. The author examines the strength and some weaknesses of power plant controls today and offers some suggestions

T. Y. MULLEN
Gilbert Associates, Reading, Pa.

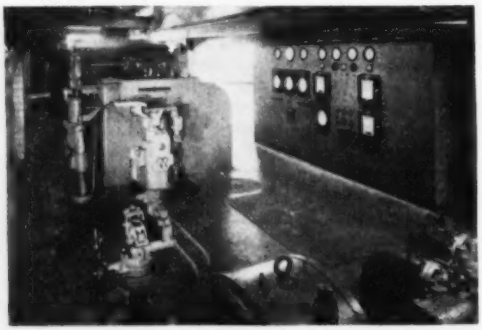
Modern central stations show a marked and continuing trend toward higher steam pressures and temperatures, larger turbines and boilers, unit boiler turbine arrangements, reheat, and central control rooms. Each of these has its own specific effect on the design and selection of instruments and controls. These trends all require higher quality instruments having increased accuracy, lower maintenance, and greater availability. For these trends bring with them higher investments, increased fuel costs, decreased supervision, and potentially greater losses in case of inefficiences and outages.

There are good reasons then why the instrument and control manufacturers should study their designs carefully and why power plant designers should select instrument and control items intelligently.

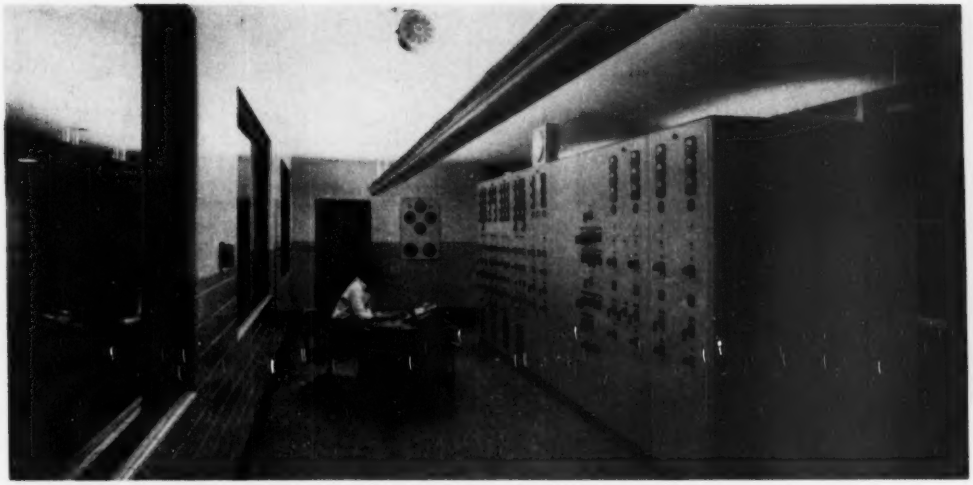
This article, based on a paper before the Instrument



TURBINE ROOM of Hickling Station, New York State Electric and Gas Corp. Central control room is behind windows



INDIVIDUAL CONTROL BOARD for topping turbine at Crawford Station, of the Metropolitan Edison Co



INSIDE CENTRAL CONTROL ROOM at Hickling Station are generator and switching panels. Windows look out on turbine room

Out of Today's Power Plant

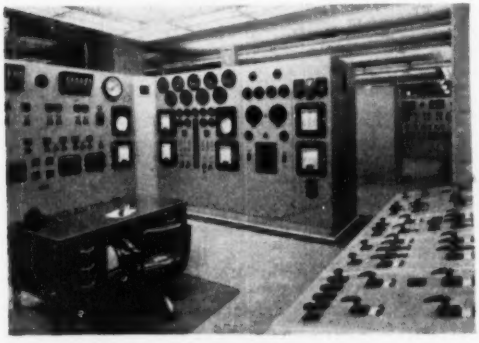
Society of America, concerns itself primarily with instrumentations and some of the more recent problems that have developed as a result of new station design trends.

Effects of Reheat . . . The most significant present trend is toward reheat units. It affects several items pertaining to instruments and their installation.

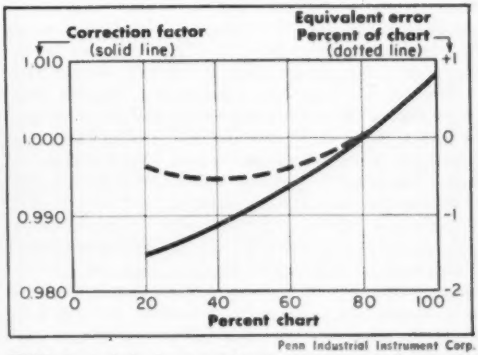
Higher pressures and temperatures require heavy wall chrome-molybdendum pipe, which is available only at premium prices. Main steam and reheated steam leads are frequently fabricated of forged and bored pipe. For a recent plant this pipe as received from the mill, cost $161 per ft for 12-in. main steam leads and $265 per ft for the 18-in. reheated steam leads. This being so, it is readily understandable why pipe diameters are being held to a minimum to effect cost savings.

However, reduction of pipe diameter results in higher steam velocities than were normally encountered in earlier installations. If orifice ratios for boiler and reheat meters are to be kept below ASME-recommended maximums, unusually high meter differentials are to be anticipated. For example, the main steam flow meter for each unit at the Titus Station of the Metropolitan Edison Co has a differential of 760 in. of water at full meter rating.

Use of high differential meters revives the importance of fluid compressibility because of the change in vapor density between inlet and outlet sides of the primary element. Since the basic equation for designing primary elements assumes that the same specific volume exists on both sides of the element, an appreciable metering error will result if appropriate allowance is not made for this change in density when calibrating the meter. The accom-

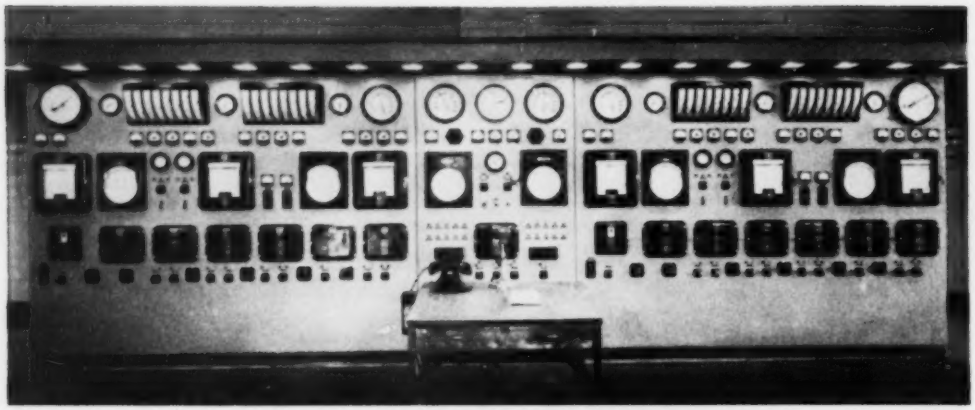


CONTROL ROOM at Warren Station, Pennsylvania Electric Co, is arranged for semi-isolated operation of boilers and turbines



Penn Industrial Instrument Corp.

ERROR due to lack of compensation for fluid compressibility or "Y" value for a 678 in. meter, 1000 psi static pressure



BOILER CONTROL PANELS in firing aisle of boilers Nos. 7 and 8 at Crawford Station of Metropolitan Edison Co

panying curve shows the magnitude of this error.

This error is considerably higher for flow nozzles than for concentric orifices having the same metering differentials. And the preference for all welded construction for high pressure and temperature steam piping tends to influence the selection of flow nozzles as primary elements.

Pressure and Temperature Compensation . . . The trend to reheat has also emphasized the requirement for pressure and temperature compensation in flow metering equipment. Steam generating units keep steam header pressures constant through combustion control systems. Steam temperatures are kept relatively constant by using large superheaters, holding high furnace exit gas temperatures, and including superheat systems with wide control ranges. Thus it is not too difficult to determine boiler or turbine efficiency, since steam flow correction is limited to temperature correction during periods when the boiler is operating below the superheat control range.

Reheat units are designed to bleed some steam between the turbine stop valve and the reheater inlet. To determine boiler output one must determine both steam flow leaving the superheater and the steam flow through the reheater. This can be done by metering both of these steam flows. But if not, it is necessary to meter one and compute the other from heat balances for each load at which the unit was operated that day. This is burdensome and unsatisfactory since it is based on numerous assumptions including gland leakage quantities, estimated losses, and other factors which tend to introduce inaccuracies.

Reheater inlet and outlet pressures vary with the load on the turbine. Pressure compensation is therefore mandatory on a reheat steam flow meter if its indications and records are to be of any great value, and the effect of fluid compressibility becomes doubly important because of the low pressure ranges involved.

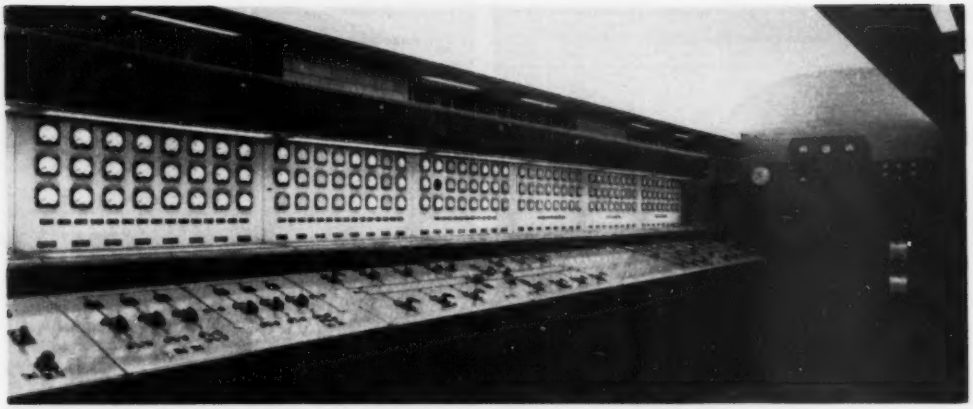
The use of lower quality coals with lower ash fusion temperatures requires lower furnace exit gas temperatures, if slagging is to be minimized. Lower furnace exit gas temperature, coupled with higher superheated steam temperatures, means that the boiler manufacturer has less heat head with which to work. Addition of the reheater surface, which also removes heat from these gases in order to return the steam to an outlet temperature of 1,000 or 1,050 F, multiplies the acute problem of obtaining the required steam temperatures with the limited heat available. This heat head limitation makes it uneconomical to add sufficient superheater and reheater surface to obtain wide range steam temperature control. The result is that steam temperatures begin to drop at higher steam flows than with conventional units of the same size.

These circumstances lead to the need for steam temperature compensation on both the superheated steam flow meters and the reheated steam flow meters in order to secure reliable guides for the control room operator and obviate the requirement for excessive calculations by the results engineer.

Other quantities to be measured in modern central stations are showing increased need for pressure and temperature compensation in metering elements. Floating evaporators have been demonstrating that they are capable of delivering steam with a very high degree of purity. They are becoming increasingly popular because they are easier and more economical to install and operate in most turbine cycles. The logical place to meter the make up is immedately beyond the evaporator vapor outlet connection. A flow meter in this location is practically useless unless pressure compensation is included.

Feedwater temperatures have tended to increase as the price of fuels increased. It is quite normal, therefore, for feedwater temperature to vary from about 325 F at ¼ load to 450 F at maximum turbine rating. This change in temperature results in a change in specific volume of the feedwater being metered which means that temperature compensation on the feedwater meter is mandatory if appreciable errors are to be avoided.

Turbine Supervisory Instruments . . . Turbine supervisory instruments have assumed a new importance with the trend to higher temperatures. The increase in size of units and the trend to reheat and central control rooms have added to the arguments for these measurements. Speed and cam shaft position recorders have achieved increasing importance in the past ten years, primarily as a means of recording operating procedure during start-up and shutdown periods, and secondly as a record of unusual governor performance immediately preceding or during turbine emergencies.



MAIN SWITCHBOARD in central switchboard control room at Russell Station, Rochester Gas & Electric Corp

The newer supervisory instruments include the eccentricity recorder, the vibration recorder, and the differential expansion recorder. This last instrument is particularly useful to operators as a guide during quick starts and during start-up periods after emergency trip-outs. It tells the operator when the machine is being loaded too rapidly and alerts him to impending rubs between moving and stationary parts within the unit due to uneven heating.

Effects of Central Control Room . . . The acceptance of the central control, employing a minimum number of operators for a maximum number of boilers and turbines, has presented several new problems. The assembly of large quantities of related data at a common point poses the problem of receiving and tabulating this data in a comprehensive manner while retaining a reasonable area of operation for the attendants.

One step has been the development of multi-record instruments to conserve panel board and control room space.

A second solution has substituted miniature instruments and small diameter indicators in place of recorders.

A third means of reducing panel board area has been a swing from the central control room conception to a semi-central control room interpretation. It strives to reduce the number of operators by reducing the amount of information provided to guide the central control room operators. This is done by providing indicating instruments for the operator and placing the recording instruments on the rear of the panels, installing sub-panels such as hydrogen control panels, etc, at various points in the plant, thus reducing the duties of the central control room operators.

Each solution has its advantages and disadvantages. The complete central control room becomes quite large because of the extensive panel areas. Such a control room can be inconvenient to operate. A sectionalized control room on the other hand does not lend itself to cooperative effort between operators of different units during emergencies. Moreover, it does not keep fellow control room operators continuously within sight of each other, thus presenting the possibility that an operator may be taken seriously ill or die without the knowledge of his fellow operator.

Multi-record instruments conserve panel and control room space but make records more difficult to read and in addition they limit the chart range selections.

Miniature instruments and small diameter dials save panel space and control room area at a sacrifice of readability and easy identification of instruments. Reduction in instrument size also reduces the operators' effective operating area since they cannot read instruments so far away.

Placing recorders behind the panel boards or in remote areas of the plant deprives the control room operators of trend records. Thus they are not so well equipped to meet an emergency as they would be otherwise.

All information indicated and recorded in the central control room is interrelated and must be intelligently interpreted and co-ordinated by the operators. Removal of recorders from the operators' view sacrifices information and tends to decrease their effectiveness in emergencies.

Unfortunately there is no ideal solution to these problems. It is not surprising that the design of central control rooms and the selection of instrumentation for central stations is in a state of flux. This is a healthy condition, for instruments and controls are being given more thought and careful study today than during any previous period.

IN SUMMARY

These station design trends:

1. Revival of the reheat cycle.
2. Larger boiler and turbine installations.
3. Unit system design.
4. Reduction of operating personnel.
5. Central control room design.
6. Higher operating pressures and temperatures.
7. Higher steam velocities.

Make these features of instruments and controls important:

1. Higher availability.
2. Increased accuracy.
3. Decreased maintenance.
4. Selection of materials.
5. Pressure and temperature compensation.
6. Size.
7. Readability.
8. Appearance.

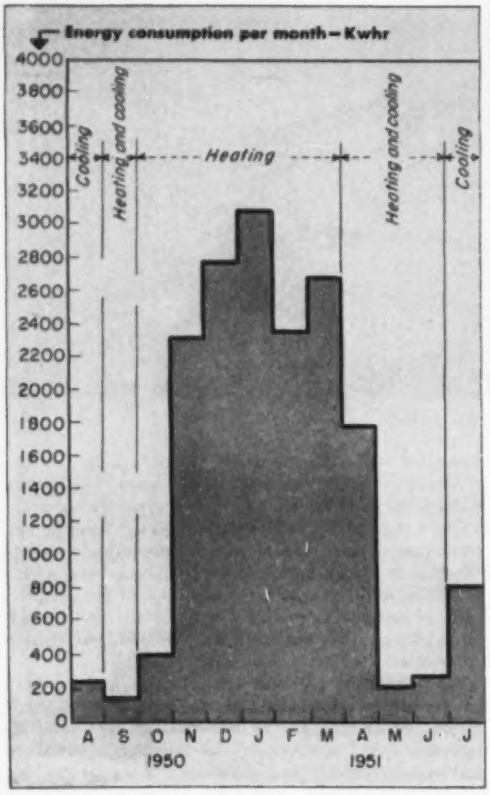


FIG 1—MONTHLY DISTRIBUTION of energy use by Unit No. 1 shows heating greatly exceeding cooling.

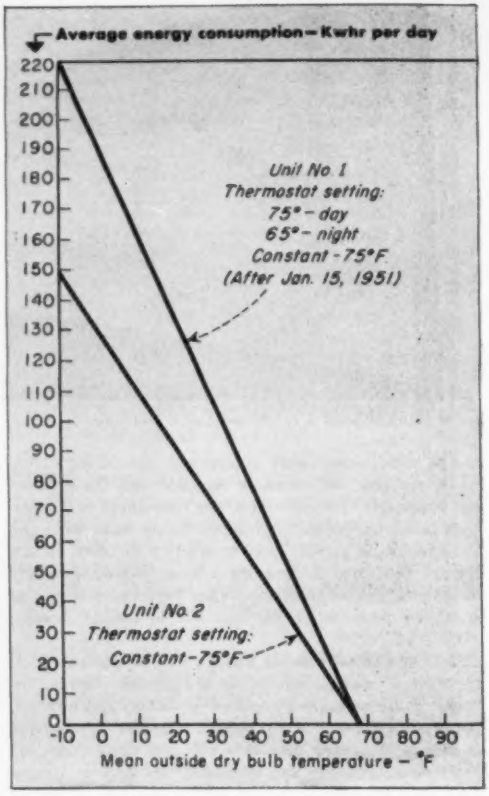


FIG 2—DAILY ENERGY USE vs outside temperature is close to straight line. In most regions power use is moderate

Load Characteristics Will Fix Heat Pump Rates

Data from installations in two Kansas farm homes show that heat pumps double previous large uses of electricity and indicate factors to be considered in rate determination

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Apart from consideration of first cost and maintenance expense, general acceptance and wide application of the heat pump are dependent on the price paid for electricity to operate it. This, in turn, is dependent on the load charactertistics of the device. For this reason, the load charactertistics of the heat pump are of primary importance to the power supplier and indirectly to the prospective user.

Source of Heat . . . When either air or the earth is used as the heat source or heat sink, the load characteristics are greatly complicated by the varying temperatures encountered. The use of well water, the temperature of which remains virtually constant throughout the year, results in less complex load characteristics. The units under discussion used well water as source and sink.

The data presented here are from the results of investigations made on six heat pump installations in Kansas residences. Load data for two of the installations are used to illustrate the type of load characteristics which may be

expected. Data are used further to show the significance of the factors affecting the winter load. The table provides a summary of the pertinent features of the two installations. Both were used to heat and cool farm homes.

Consumption Doubled . . . The total heat pump energy consumption for the 12 months from Aug. 1, 1950 to Aug. 1, 1951, was 17,261 kwhr for Unit No. 1 and 12,054 kwhr for Unit No. 2. From these figures the reason for viewing the heat pump load quantitatively is obvious. Although these two customers would be classed as "heavy use" consumers without the heat pump load, their yearly consumptions were approximately doubled by it. The total annual energy uses were 24,760 and 25,681 kwhr respectively for the two farms. This is in an area where an annual energy consumption of 2,500 to 3,000 kwhr per farm is common.

Fig 1 shows the monthly distribution of the annual electric energy usage for Unit No. 1. Similar data from Unit 2 show only minor variations from this pattern. It is believed that the pattern shown in Fig 1 may be considered as indicative of the kind of load distribution that may be expected. It agrees with predictions based upon experience with gas heating and with central system air conditioning.

Maximum and Average Demands . . . Annual load factors for each unit as shown in the table are based on one-hour demands determined by the integration of recording wattmeter load curves. Thus, the annual load factor at maximum demand is the ratio of the average one-hour load for the entire year to the maximum one-hour integrated demand occuring during the year. In the case of both heat pump units, the maximum demand was higher than the full power rating of the equipment. This was caused by continuous operation at overload during an entire one-hour demand interval at one or more times during the year. This overload was not caused by lack of heating capacity but by temporary abnormal conditions.

Annual load factors are also shown based upon the three highest monthly average demands during the year for each unit.

Related to Design Factors . . . The annual load factor based on the maximum demand during a year is a function of the ratio of the installed capacity of the heat pump to the heating requirements of the house. For design conditions, the most extreme situation to be met, the ratio was 1.05 for Unit No. 1 and 1.15 for Unit No. 2. Corresponding to these ratios are annual load factors of 20.5% and 15.8% for Units No. 1 and 2 respectively.

For a given installation, the monthly average demand is affected very little by the ratio of the installed capacity to the required capacity. Hence, for the purpose of comparing the types of loads of different units, the annual load factor based on highest monthly average demand is apparently more useful than load factor based upon maximum demand. It would be ideal from a load standpoint if a heat pump system could be so designed that the power requirement would never exceed this demand. However, a system designed in this manner obviously would be under capacity since this demand is an average.

Small Change in Load Factors . . . The differences in annual load factor based on monthly average demands for

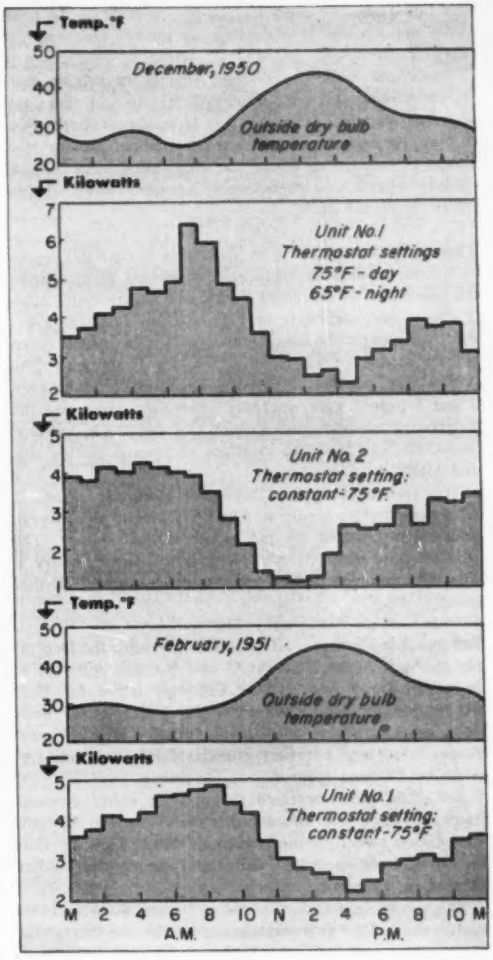


FIG 3—EFFECT of thermostat management on daily load curve

both units can be seen in the table. It shows that, although the total loads on the systems were quite different, differences in load factors are small.

The heat loss characteristics of the houses in which the heat pumps were installed are shown in Fig 2. The curves show how the energy requirement for heating each house varied with the outside dry bulb temperature. In addition to these characteristics, two other interesting observations can be made from Fig 2. It shows that if a 75 deg F room temperature is maintained, heating is required whenever the mean outside dry bulb temperature is below approximately 68.5 deg F, and that the practice of decreasing the thermostat setting from 75 to 65 deg F at night does not effect an observable energy saving.

Predict Energy Use . . . Fig 2 clearly indicates that the outside dry bulb temperature is the most important factor affecting the heat pump energy requirements during the winter season. Therefore, when the heat loss characteristics

of a house and the coefficient of performance of the heat pump are known, it is possible to predict the monthly energy requirement.

Prediction of the energy requirements for cooling during the summer season is more difficult. In fact, there are so many variables involved that it is almost impossible to compute in advance the energy required for summer cooling. Predictions based on experience with similar cooling systems in a given locality are much more reliable than computed values.

Thermostat Setting . . . It is interesting to note the degree to which the load characteristics of a heat pump system are influenced by the house thermostat management. This is shown very definitely in Fig 3. Until Jan. 15, 1951, the thermostat controlling Unit No. 1 was turned down from a setting of 75 deg F to 65 deg F at night. The setting was restored to 75 deg F at sometime between 6 and 7 o'clock every morning. February, 1951, was the first complete month during which Unit No. 1 was operated like Unit No. 2 with a constant thermostat setting day and night.

The average daily load curves of Units No. 1 and 2 for December are shown in Fig 3. A plot of the average hourly temperatures for the month is also shown. The average daily load curves of Unit No. 2 for February is shown along with a plot of the temperatures for that month.

Difference in Curves . . . The contrast between the December load curves for Units No. 1 and No. 2 is apparent as is the similarity between the February curve for Unit No. 1 and the December curve for Unit No. 2. Both units were supplying heat under virtually identical conditions, since the February climatic factor was not significantly different from that of December.

Since the units operated through an entire demand interval once or more often during the month, the monthly load factor based on the maximum demand during that month was not materially influenced during the coldest months by thermostat setting.

The annual load factors based on highest monthly average demands were influenced materially by the thermostat management and this fact is shown in the table. The comparison is somewhat complicated by the fact that the thermostat settings for Unit No. 1 were changed.

The highest monthly average demand for Unit No. 1 should have come in January, the coldest month, except for the change in thermostat management. It did occur in January for Unit No. 2. Since lowering the thermostat setting at night resulted in higher values for the monthly average demand, the greatest monthly value for Unit No. 1 came in December, the last full month during which the practice was followed.

Effect of Summer Cooling . . . The question arises as to why the annual load factors based on these demands are nearly the same for both units in December. A higher demand should result in a lower load factor whereas the actual difference shown is not great. The answer is found by examining the values of load factors for February, the first full month during which the units operated on a comparable basis. The load factor for Unit No. 1 is considerably higher than for Unit No. 2. The same relationship would have existed in December except for the

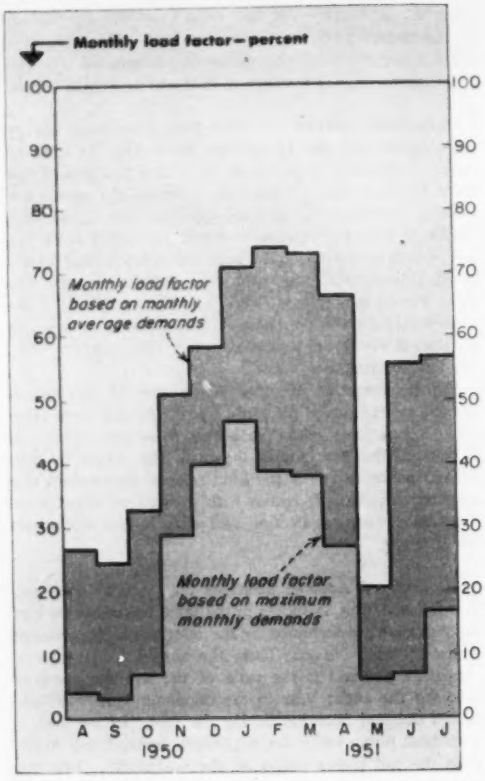


FIG 4—MONTHLY LOAD FACTORS of Unit No. 1 show the great effect of change in thermostat setting made in January

Characteristics of Two Heat Pump Installations

	Unit No. 1	Unit No. 2
Estimated winter heat loss of house, btu per hr (Design condition 70 deg to −10 deg F)	91,500	71,500
Summer heat gain	Not estimated	Not estimated
Heating capacity of heat pump system under prevailing conditions, btu per hr	96,000	82,000
Ratio of installed capacity to heating requirements at design conditions	1.05	1.15
Coefficient of performance (Heat output, btu per hr divided by energy input, btu per hr)	2.95	3.40
Horsepower output rating of system	9.5	6.0
Electric energy used in one year, kwhr (August 1, 1950 – August 1, 1951)	17,261	12,054
One-Hour integrated demand, kw		
Maximum demand for year	9.64 Overload	8.70
3 highest monthly average demands		
December, 1950 (maximum of year, Unit 1)	6.42	4.22
January, 1951 (maximum of year, Unit 2)	6.30	4.30
February, 1951	4.75	3.84
Annual load factor		
Based on maximum demand for year, %	20.5	15.8
Based on 3 highest monthly average demands, %		
December, 1950	30.6	32.6
January, 1951	31.3	32.0
February, 1951	41.5	35.8
House thermostat setting	75 deg F day, 65 deg F night Constant at 75 deg after January 15, 1951	Constant at 75 deg F
Total electric energy used by heat pump owner, kwhr	**24,760**	**25,681**

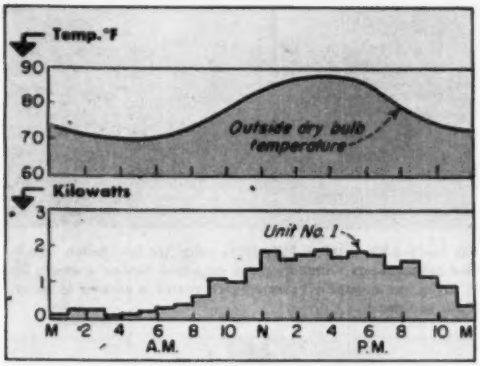


FIG 5—SUMMER COOLING. Average daily load curve for July 1951 shows the demand never exceeds that of two electric irons

influence of thermostat management. The higher annual load factor for Unit No. 1 based on the monthly average demand in February is caused by a greater amount of summer cooling service. The improvement in the annual load factor for Unit No. 1 that accompanied the change in thermostat management appears to be significant.

Monthly Load Factors . . . That the change in practice of setting the thermostat altered the character of the load of Unit No. 1 is shown again in the upper curve of Fig 4. This curve presents the monthly load factors based on the monthly average demands. The curve would have peaked in January had the practice with respect to the thermostat been the same throughout the heating season. The data are not complete for February, 1950, but examination of the data for March bears out the conclusions. Whereas the heating load for March, 1951, was only 18% higher than the heating load for the same month in 1950, the load factor was 49% higher.

The lower curve of Fig 4 shows the monthly variation in load factors based on the maximum demands for the month. It has been stated that the manipulation of the thermostat did not influence the load factor when so based. The load factor for March, 1951, is 21% higher than for March, 1950. This increase reflects the greater heating load and indicates that well over half the increase in the values represented by the upper curve was caused by the change of practice with respect to the thermostat.

Rate Determinations . . . If the heat pump saturation on any electric system becomes great enough, the characteristics discussed will have a definite bearing upon the rates that can be offered by the power supplier. The ultimate effect upon rates can be determined only by considering the heat pump load in its relationship to the load characteristics of each electric system. However, with these data, it is possible to evaluate some of the more important factors that will influence the determination of rate schedules.

Monthly distribution of annual energy consumption does not favor a low rate schedule for heat pump operation. In the examples shown, 88% of total energy usage occurred in the six months period from November to April inclusive. Energy consumption during the coldest month was 32% higher than the average for six months. Energy used by the heat pump during the same six months period accounted for 61% of the total energy used by the customer during the year. If heat pump saturation on an electric system became high, the resulting load would be undesirable unless it complemented existing seasonal peaks of like proportions.

Possible Off-Peak Load . . . If the winter heat pump load should cause or should coincide with seasonal peaks of energy usage, the apparent adverse effect on any given electric sytem might be greatly modified by consideration of the average daily load curve. It is highly probable that a large proportion of the heat pump energy usage would occur during off-peak hours.

During December 1950 when the average daily load curve for Unit No. 1 peaked sharply between 6 and 8 am as a result of thermostat management, 34% of the average daily energy usage occurred between 10 pm and 6 am. This is an off-peak for many electric systems. In February 1951 when the thermostat setting was unchanged at night, the peak was not so well defined. Thirty-seven percent of the average daily energy usage occurred betwen 10 pm and 6 am.

The house in which Unit No. 2 was located had a large picture window facing the south. This tended to decrease the energy required for heating during the afternoon and probably increased the heat loss at night. During December 1950, 43% of the energy used by Unit No. 2 was used between 10 pm and 6 am.

It appears from these later considerations that a moderate heat pump saturation could provide a desirable type of load for many electric systems. Some systems might find that this load would fit into existing load patterns well enough to justify favorable electric rates for the heat pump.

Summing Up . . . Although the electric energy usage of the heat pump is potentially great, its practical application will depend to a considerable extent upon the rate at which energy can be supplied. Hence, its load characteristics constitute an important consideration.

To attain the highest possible annual load factor based on maximum demand and still provide satisfactory heating, a heat pump system should be designed exactly to match the design heating load of the house.

The annual load factor based on maximum demand is not materially affected by house thermostat management, but it is directly affected when the heat pump is over capacity for its load. Exactly the reverse is true of the load factor based on highest monthly average demand. Hence, in the test results, the load factor based on highest monthly average demand is more truely indicative of the characteristics of a heat pump designed to match its load.

The practice of turning the house thermostat to a lower setting at night caused a high load peak when the higher setting was restored in the morning, but it did not effect an observable saving in total energy used.

For the latitude in which these heat pumps are located, the annual electric energy requirement for heating is 10 to 15 times greater than for cooling. The resulting distribution of annual energy usage may exert an adverse influence upon some electric systems. However, for systems where the summer peaks caused by air conditioning are very high, the heat pump load could be highly desirable.

By reducing its substation arrangements to the minimum number of basic designs that will handle all system needs, Pennsylvania Power & Light Co has

- **Speeded material procurement**
- **Made maintenance easier**
- **Cut first cost**
- **Improved reliability**

all during a period of rapid system expansion

W. B. MORTON and L. L. NONEMAKER
Pennsylvania Power & Light Co, Allentown, Pa.

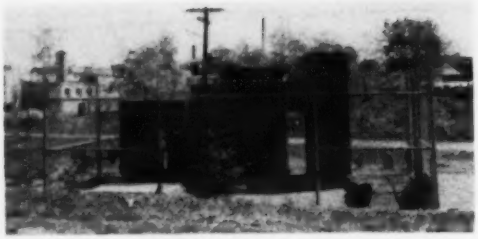


FIG 1—12-4-KV UNIT SUBSTATION comprises four factory assembled compartments. Installation and alignment become a simple job by having two longitudinal concrete piers poured in advance of receipt of the equipment

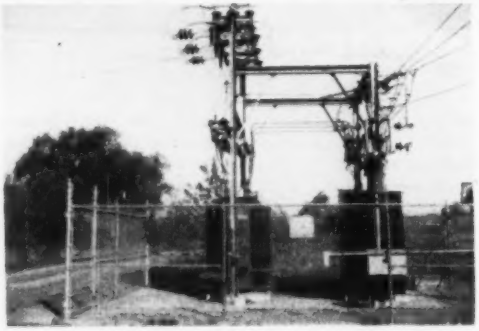


FIG 2—EQUIVALENT TO UNIT SUBSTATION both functionally and electrically, this open type 12-kv substation, utilizing the standard unit principle of design, is installed where space permits and its open construction is not unsuitable

Seven Standard Substations Fit System Needs From 4 to 220 Kv

In the six years since the end of World War II, Pennsylvania Power & Light Co has standardized its substation designs to meet the needs of a greatly expanded rebuilding and construction program.

In all designs the unit principle of structure design with minimum use of steel and insulators and standard arrangement of structures has been adhered to. The aim was to simplify procurement of steel, to make maintenance easier, to reduce first cost, and to improve reliability and safety on the finished job.

Many times during the hectic program at the close of World War II it was necessary to order large quantities of steel well before substation requirements were known in detail in order to have the steel ready when needed. Without the use of standard designs this would have resulted in considerable confusion and possible lack of critical materials. These are the reasons why the standardized unit substation structure has been and will continue to be a boon to the rapidly expanding construction program of the company.

The principal transmission voltages used are 220 and 66 kv. Distribution is largely at 12 and 4 kv. While several other voltages are in use about the system, additions generally use these four standard voltages. Consequently, standard substation structures have been designed for them. But the designs may readily be adapted to any other voltage as the needs require.

Distribution Substations . . . The 12 to 4-kv substation designs are of two types: (1) The metal enclosed "package" or "unit substation," supplied by the manufacture in its entirety, and (2) the open-type substation using a standard unit design structure. The factory built unit substation is far more costly than the open type substation, but it is well adapted for closely built-up areas or where the open structure type may be unsuitable for other reasons.

The units differ widely in physical appearance (Fig 1 and 2). But design requirements and electrical arrangements are essentially identical. The basic requirements for a 12-4-kv substation on this system are: (1) That it supply a single 4-kv feeder through a circuit breaker and (2) that it have a single 2,000-kva autotransformer with a normal loading in the order of 75%. This makes maximum use of

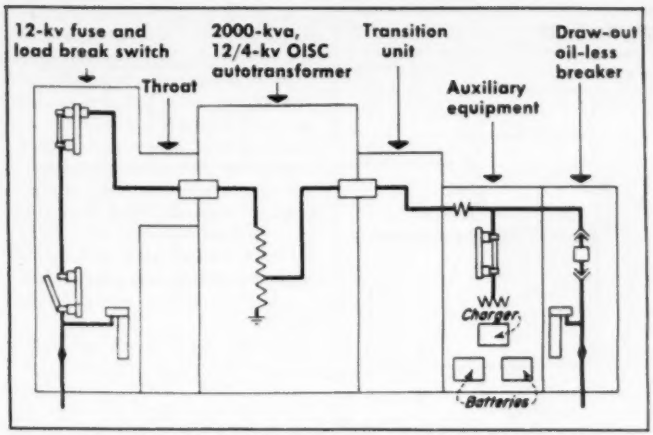


FIG 3—INDEPENDENT TESTING of the auto transformers is provided for by removable links in the throat which permit isolation of the transformer and adjacent equipment

transformer capacity without sacrificing continuity of service because load can be transferred to adjacent stations if required.

Only major difference between these two standard substations is that with the open-type a by-pass disconnect for the 4-kv circuit breaker can be provided economically if it is required for inspection or maintenance. However, most of these substations are installed with the idea of transferring the 4-kv load to other substations; so a by-pass switch is not provided.

A diagram of the basic arrangement of the unit substation is shown in Fig 3. The 12-kv supply enters underground into its compartment, which contains lightning arrester, manually operated load-break switch, and fuses. It is throat-connected both to a 2,000-kva, oil-filled autotransformer equipped with no-load tap changer and to the auxiliary equipment compartment. Removable links in these throats permit independent testing of the transformer.

The 4-kv transformer loads pass through the auxiliary equipment compartment into a compartment that houses the 4-kv draw-out air circuit breaker and associated control and relays. The 12-kv load-break switch is interlocked with this 4-kv circuit breaker. Lightning arresters are provided on outgoing 4-kv leads which leave underground. There is no automatic regulation of any kind. Company practice is to control 220- and 66-kv system voltages and to use both 12- and 4-kv switched shunt capacitors for distribution voltages.

About 25 substations of the type of Fig 1 were installed on this system since World War II.

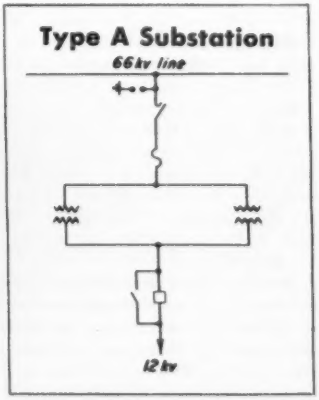
Wherever possible unit substations are located close to an alley or street so that oil hose and test cables can be run to them from the curb. But if this distance is too great, gravel of the switchyard is extended to form a road to the area alongside the transformers.

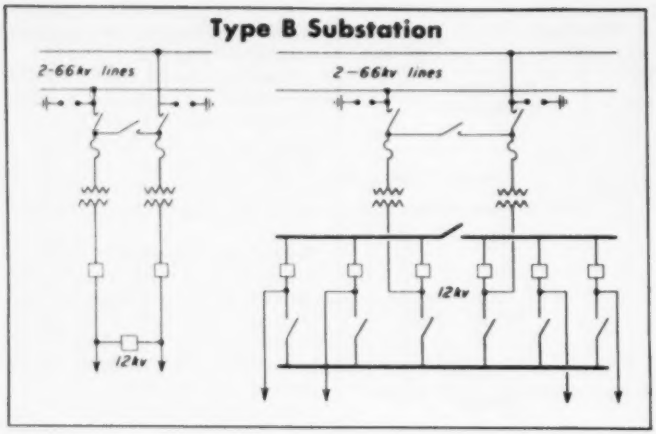
Transmission Substations . . . Functionally and electrically, the 66-12-kv and 220-66-kv substations are divided into Types A, B, C, D, and E. Physical layouts of these substations have been designed to make use of standard unit structures.

Type A Substation . . . As shown in Fig 4 this type consists basically of a single incoming source and one or more outgoing lines. Either one or two transformers of 1,500 or 2,500 kva each are used, or in some cases two units as high as 5,000 kva each. Where two units are installed, each one is loaded in the order of 75% of capacity so that one transformer can be removed by temporarily overloading the other. When there is a single transformer, load is transferred to an adjacent station. The station's single 66-kv supply is through an air break switch and fuses with lightning arresters ahead of the switch. There can be one, two, or three outgoing circuits.

A typical Type A substation with unit type structure is shown in Fig 4. It consists of a combination deadend, switch, and fuse structure that forms one end support for the transformer connection bus. A similar structure, without provisions for switch and fuse,

FIG. 4—STANDARD UNIT STRUCTURES of portal design built of structural members with minimum of lattice work and guyed to reduce costs of foundations are quickly and easily erected with a minimum of field labor in construction of Type A substation





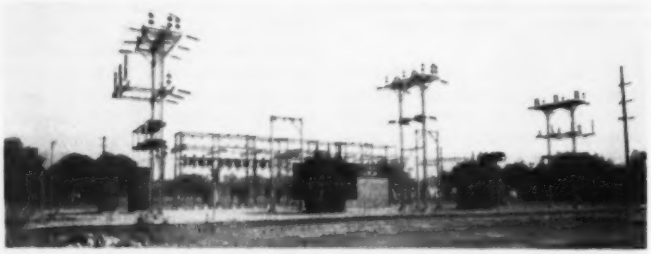


FIG 5—TYPE B SUBSTATIONS combine the same standard unit structures as for the Type A substation. It can be built for capacities as high as 40,000 kva. All operations are from the ground, and do not require ladders or platforms. This includes easy replacement of high voltage fuses in all kva ratings and up to 138-kv class, with switch sticks

deadends the opposite end of this transformer strain bus. Transformers are connected to this bus in a way that permits quick and easy removal.

Moreover, they are widely spaced for fire protection, a precaution that provides room to add a third transformer if some emergency so dictates. Structures involved are portal design, built of members with a minimum of lattice work, and guyed to reduce the cost of foundations. No trouble has been had with guyed construction.

This design permits all normal operations to be performed from the ground, without ladders or platforms. Fuses are replaced as simply as opening a disconnect switch by means of ordinary switch sticks without obtaining line clearance. This applies to fuses in all ratings, even in the 138-kv application.

The 12-kv OCB structure is also of unit design. It accommodates an oil circuit breaker, disconnect switches, and lightning arresters, and may have single bus as shown or have both operating and transfer buses.

Type B Substation . . . This design, shown in Fig 5 is used when two sources of supply are required to provide service with a higher degree of continuity. It has two, three, or four 3-phase transformers each rated 5,000, 7,500, or 10,000 kva. Transformers are in two banks supplied from two 66-kv sources, each feeding its bank through an air-break switch and fuses with lightning arresters. There is provision to tie the sources through with an air-break switch if required.

Transformers feed either two outgoing 12-kv lines with a tie breaker between, as shown in Fig 5 (in which case all three breakers are normally closed), or through transformer breakers to a 12-kv operating bus supplying three or more outgoing lines. Connections from each line are provided to by-pass the breakers through a disconnect switch to a transfer bus. Type B substations are used for capacities as high as 40,000 kva; yet they have the same unit structure design as Type A substations for 1,500-kva capacity.

A typical Type B substation is illustrated in Fig 5 showing the method of combining the unit structures of the Type A to make the Type B design. The only exception is that two switch and fuse structures are used for two incoming 66-kv lines with a common transformer bus deadend structure that can be used for a tie air-break switch if required. When more than three breakers are installed, a standard brick control house is furnished containing control and relay switchboard, 125-v battery, and telephone facilities.

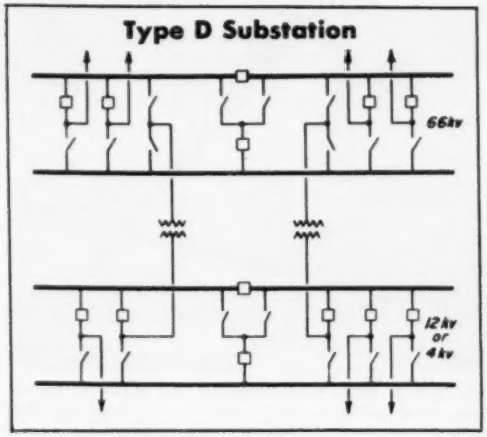
All control cables are non-leaded and laid directly in the earth with creosote plank covering. An open area is left below the floor in the control house where cables are run in metal trays to their termination at the switchboard.

Where only three 12-kv breakers are installed, no control house is provided. Relays and control equipment are located in the breaker control housings with a 28-v station battery installed in a small steel housing.

Type C Substation . . . This type is primarily a switching center for a limited number of 66-kv lines. In addition to 66-kv switching, it has a Type B transformer station incorporated in it. The basic design is either a ring bus or straight single operating bus with transformers direct connected to the bus without breakers. Since the Type C substations are very few in number on the system, they will not be covered in this discussion.

Type D Substation . . . Shown in Fig 6, Type D substations are used for concentrations of load requiring large transformer capacity and where switching for several important 66-kv lines must be provided. It is most representative of medium size substations on the system. The 66-kv portion of the station provides an operating and an inspection bus with a single breaker connection to the operating bus and disconnects or air-break switch connections to the inspection bus. Bus tie breakers and in some cases bus sectionalizing are provided. Two or more transformer banks feed a 12-kv bus with usually four or more outgoing feeders at 12 kv emanating from the substation.

This type substation, Fig 6, uses a minimum of steel for both operating and inspection buses. It is designed with a center mast head for straining



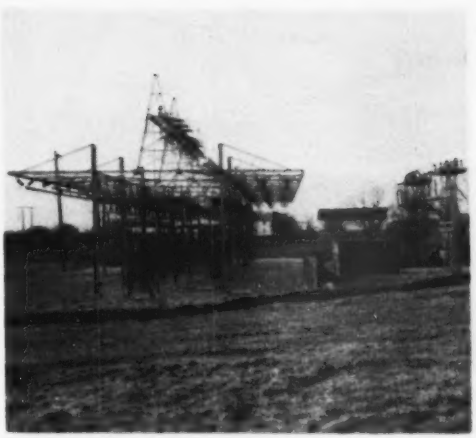


FIG 6—OPERATING AND INSPECTION BASES are included in this unique cantilevered bus design with buses constructed of flat copper, backed up by steel angles and hung from suspension insulators, providing ground room around the equipment

lines in either direction. The buses are unique in that they are constructed of flat copper backed up by steel angles for structural support and hung from suspension type insulators. This construction combines rigid bus construction with safer suspension insulators. The buses are cantilevered from the main structure. Note the amount of ground room around the equipment and the small amount of steel surface that requires painting. In this design, substation steel requirements per kva have been reduced to a minimum.

Type E Substation . . . Fig 7 shows the Type E design. It is representative of connections for substations where concentrations of power are very large such as at major generating stations and major tie transmission stations. A complete double-bus, double-breaker design is used and may involve switching of both 200 kv and 66 kv. It usually has step-down transformer banks from 200 kv and 66 kv. The 66-kv buses are likewise double-bus, double-breaker type of arrangement for these large station.

A simplified sketch showing a cross-section of the new standard 220-kv switchyard utilizing unit design structures is shown in Fig 7. As in all of the new standard substations, strain buses are used throughout, eliminating the use of tubing for all high voltage buses. Disconnecting switches ahead of the breakers are connected to the bus through flying taps, with no supports between the disconnection switches and the buses. The bus strains over three bays between supports.

The 66-kv section of this new substation is identical to the 220-kv as shown here, except for correspondingly reduced spacings at 66 kv. The 220-kv oil circuit breakers are of the low oil content type.

As a substitute for the conventional expensive oil piping system, a 4,000-gal oil tank trailer is used in the filling and rehabilitation of the oil-filled equipment. No permanent oil piping systems are installed in any new substations on the system. This oil handling scheme, initiated several years ago, has proved to be very effective and quite satisfactory in service. It has saved considerable expense, both in first cost and in subsequent maintenance costs of oil handling and rehabilitation.

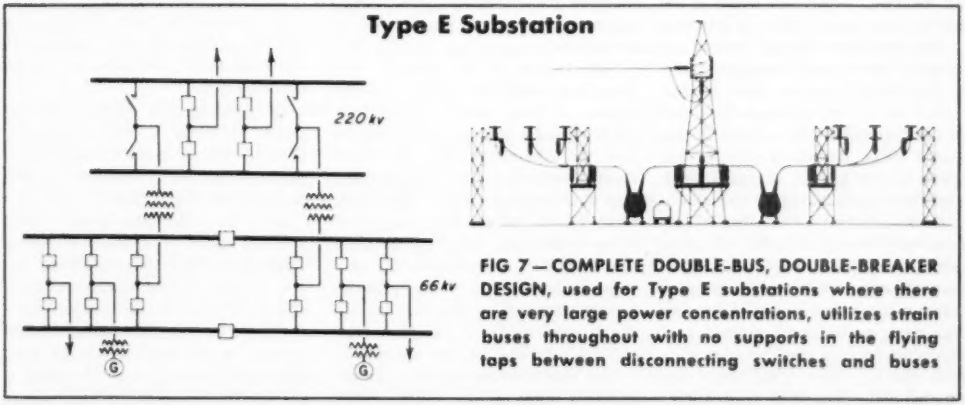


FIG 7—COMPLETE DOUBLE-BUS, DOUBLE-BREAKER DESIGN, used for Type E substations where there are very large power concentrations, utilizes strain buses throughout with no supports in the flying taps between disconnecting switches and buses

DIAMOND MESH, installed in 4-foot square sections in lieu of standard louvers, provides low-cost cutoff for lighting installation

PATTERN OF MESH becomes apparent upon looking directly at ceiling. Mesh was laid on inverted steel tees, 12 in. below the lamps

Wire Mesh Cutoff Cuts Lighting Costs

CARTER E. HEWITT, Architect
S. ALAN BAIRD, Consulting Engineer
Peoria, Illinois

Use of No. 9 gauge diamond expanded metal mesh 12 in. in lieu of the standard egg-crate louvers below fluorescent tubes has resulted in an attractive and efficient lighting installation in the new Peoria, Ill., office building of the Toledo, Peoria & Western Railroad. Cost was appreciably lower than that of a standard installation. Although considerable experimental work was required to produce the result, it was well worth while.

The finished expanded metal ceiling cost $1.75 per sq ft or about half that of the lowest cost aluminum or plastic louver systems available. Result was a saving of nearly $15,000 in the overall job cost. While the cutoff is not perfect, the visual effect is pleasing.

The building depends wholly on artificial lighting and ventilation. Only in the reception room which is glass walled on its two exposed sides, and in the president's office where double glazed strips provide a view of the yards, is there any use of natural light. Therefore, good lighting is essential.

Roof construction consists of exposed steel beams of 12-in. and 14-in. depth on 20x24-ft bays, with 12-in. junior beams on 8-ft centers spanning between the larger beams. Over this framing is a reinforced gypsum roof supported on steel tees and fibre glass form sheets. Fibre glass sheets are exposed and, when spray painted, provide reflective surfaces for light, excellent acoustical absorbing quality, and some temperature insulation.

Tees supporting these sheets occur at 32-in. intervals and furnish support for the fluorescent lamp assemblies which are spaced at approximately 30-in. intervals. Two 8-foot units are used end to end to provide even coverage in the 20-ft long bays.

Actual maintained light intensity at desk top level is estimated at 48 ft-c although first tests results were actually higher since all tubes were new. Without the expanded mesh ceilings the bare tubes would provide 60 ft-c maintained.

Appearance of the painted fibre glass was somewhat rough; so some degree of visual cutoff was desired. Cost estimates prompted experiments with the diamond mesh. Across the short dimension of the diamond openings this material gives a 30 degree visual cutoff. On the long axis it provides a network which gives good visual relief as compared to that provided by bare lamps. It also provides a very attractive ceiling to cover the rough appearance of the fibre glass without affecting its fine acoustics.

Test material was sprayed at an automobile shop in flat white. When suspended 12 in. below the lamps, the wire mesh reduced the transmission of light about 20% as tested with a light meter. This loss was felt to be well within practicable limits.

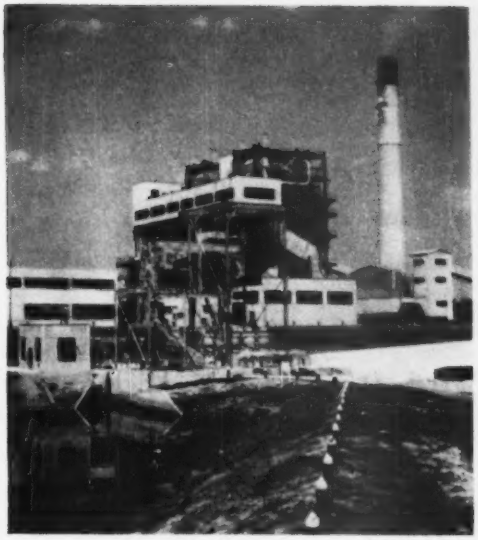
Supporting the Mesh . . . The diamond mesh material was found to be self-supporting over 4-foot spans. Application was therefore planned to use stock size sheets 4x8 ft, cut in half, and supported on 1x1x1/8-in. steel tees welded continuously to the lower flanges of the 14-in. deep structural steel beams.

Sheets were laid loose on the tees. It was originally believed that lamp and ballast replacement would necessitate hinged panels for access, and some constructions of this kind were made and tested experimentally. They proved awkward and unnecessary. Lifting the sheets, which weigh about 60 lb, and sliding them horizontally on top of the next sheet proved to be a simple and convenient way of making replacements. Had there been a problem of building vibration, sponge rubber strips would have been used under bearing edges.

In painting the sheets care was taken to apply a rust preventive primer, then a good enamel which produces an elastic enamel coating that will not chip or flake.

Over the aisles around the central working space is a lowered ceiling which houses the air supply duct system. These ducts discharge fresh filtered air at controlled temperatures above the level of the expanded metal ceiling. In this way there is no other duct work required, and the ceiling is left free to do its lighting job.

- Larger, more efficient units
- Higher generation voltages
- Controlled circulation
- Diversity in building-walls
- Pressurized combustion
- Boiler supervision by TV



Ebasco Services Inc

LUMBERTON STATION, Carolina Power & Light Co

Are Design Trends In 92 of the Newest Power Plants

New generating capacity aggregating 13,572,300 kw and representing 141 units in 92 station increments is embraced in the accompanying compilation. These are units which have matured and gone into operation since the prior survey* was compiled along with the future ones up to 1954 or even 1955 insofar as their details have been established by the designers.

The details studied for each item are over 180 in number; therefore the compilation provides a compact index of current plants so that ready reference can be made to answer the common question: "Who was it that did what in which station, why, and with what associated departures elsewhere in the plant." In brief, this present report in conjunction with the earlier one constitutes the beginnings of a condensed library of power plant design.

Outstanding trends that have been manifested in this study are:

1. Approximately half the turbines and generators continue to be preferred standard units.
2. Higher voltages 15, 16, 18, and 20 kv are being applied to generation.
3. Reheat has established itself except where fuel cost is too low to warrant it.
4. Controlled circulation has entered the field anew.
5. Diversity in building-wall construction is available to meet local circumstances.
6. Wide diversity is reflected in the means used to control superheat and reheat temperatures.
7. Earth-moving equipment is strongly preferred for stock piling and reclaiming coal.
8. More of the equipment is being placed in the open.
9. Pressurization of combustion space is a practice gaining acceptance.
10. Mechanical dust collectors are favored three to one over electrostatic but are combined with them in numerous installations.
11. Valves more frequently are being omitted from the main steam line up to the turbine stop valve.
12. Grounding of generator neutrals is dominantly by a small (distribution-type) transformer with secondary resistance.
13. Television is being adopted rapidly for boiler supervision.

Taking up the items in systematic sequence, it is possible to set down a score-card which gives further evidence of prevailing thinking among today's power plant designers.

General Features

1. More plants are reflecting a willingness to go "outdoors"; in fact four have only the controls and pumps inside a building. Thirty plants have both FD and ID fans outdoors. There are 16 with ID fans outdoors and 10 with FD fans outdoors. Boilers to the number of 44 are wholly or partly outdoors, and 10 have the turbines also outside. Air preheaters, 51, are most often outdoors.
2. Wall material is brick in 41 instances, aluminum or Q-panel in 12 others, and concrete or cement-asbestos in 27 more. Mention is made of several combinations.

* "Destinctive Design Features of 81 Postwar Power Plants"—May 8, 1950.

Fuel Handling

1. Earth-moving equipment predominates for piling and reclaiming coal; 50 of 60 plants so report.
2. Pulverizers are located close under the bunkers in 51 of these same coal plants.
3. Pulverizer types are 25 ball and 21 bowl.

Steam Generator

1. Unit boiler-turbine arrangement is almost universal, with exceptions usually associated with plant additions.
2. Circulation is dominantly natural, however, the plants show 2 dual and 6 forced (or controlled). There are known to be 18 of the latter on order, in service, or on the way.
3. Pressurizing is primarily associated with gas or oil fuel, but there are 4 cases involving coal.
4. External combustors are hardly representative in number (8 in 2 plants) because the companies known to be using them did not report in time to be included.
5. Dominant method of superheat temperature control is damper with 17 instances, burner adjustment in combination with spray in 12.
6. Dominant method for reheat temperature control is damper (18), with burner and spray next (16), straight spray (12), and various other combinations trailing.
7. Television is growing as a means of policing gauge glass (25) and burner flames (17). One company also watches its stacks by television.

Ash Control and Disposal

1. Mechanical (29 solely) and electrical (9 solely) dust collectors are usually placed in that order when combined (13), but 3 instances specifically reverse the sequence. Electrostatic are frequently outdoors (6), but mechanical even more often (12).
2. Four plants make cement from ash; fifth, "probably."

Heat Cycle Apparatus

1. Reheat was adopted in 35 instances, mostly above 60 Mw; it was (presumably considered and) rejected in 41 instances where ratings are at or above the same figure, most of them in fairly cheap fuel areas.
2. Evaporation (30) and Zeolite (5), especially in combination (70) are the dominant practice for makeup. However, 10 report adoption of demineralization for makeup and 3 more for pretreatment of evaporator makeup.

Piping

1. Omission of valves between superheater and the turbine stop-valve is common (21), but 32 report one or more intervening valves.
2. Plants to the number of 13 report using aluminum cellular insulation for high temperature piping.

Turbine and Condenser

1. There are 33 turbines which are preferred-standard.
2. Side outlet exhaust with condensers adjacent is reported in only 6 instances.
3. The condenser is outdoors with the turbine in 6 cases.

Condensing, Cooling Water

1. Cooling towers (20) are reported, mostly in the central and southwestern areas.
2. Difference in head actuates the screen automatically in 28 cases and gives alarm for remote control in 4 others.

Fans and Pumps

1. Both types of fan are outdoors in 30 cases but the ID fan alone in 16, the FD alone in 10 cases.
2. Fans to the extent of 13 use hydraulic couplings, and 9 use electromagnetic. Feed pumps have hydraulic couplings in 9 instances.

Alternator

1. Only 40 generators are preferred standard units.
2. Terminal voltage is dominantly 13.2 to 14.4 kv (65 cases), but 13 cases report 18 kv, 2 report 15.5 or 16.5 kv, and 2 report 20 kv.
3. Neutral grounding through a distribution-type transformer with resistance in its secondary outnumbers resistance and reactance grounding in the ratio 56/19/11.

Excitation System

1. Exciters are direct-connected to the turbogenerators in 36 cases of main and pilot; 34 cases of main exciter only.
2. Spare exciters were omitted in 35 cases.

Station Auxiliary Power

1. Shaft-generators are the decision in 4 instances with the auxiliary tapped off generator leads in 76 cases and off an incoming bus in 12 cases.
2. Dry-type transformers are recorded for 13 jobs, and 3-phase ratings are the rule.
3. Motor enclosures stand in the following proportions; Totally enclosed (34), waterproof (16), splash-proof (21), drip-proof (3), and moisture-proof (3).

Control Room

1. Centralized control is completely applied in 66 cases.
2. Polyethylene-polyvinyl control cable insulation is broadly favored (38 cases solely); inorganic or mineral insulation has been adopted in part at least in 20 plants.

Buses

1. Circuit breakers at generator voltage are reported specifically for only 10 plants.
2. Isolated-phase construction is reported for 46 generator leads or buses and 8 generator switchgears. Corresponding segregated-phase figures (22) and (13).
3. For the auxiliary bus the preference is for segregated-phase (45) as compared with isolated-phase (10).

Transformer Yard

1. Cooling design runs self (6), FOFA (23), FOA (20), FA (12), and SFA (8).
2. Fire protection stands (17) for emulsifier, (37) for water, (4) for CO_2, and (3) for none.

Lighting

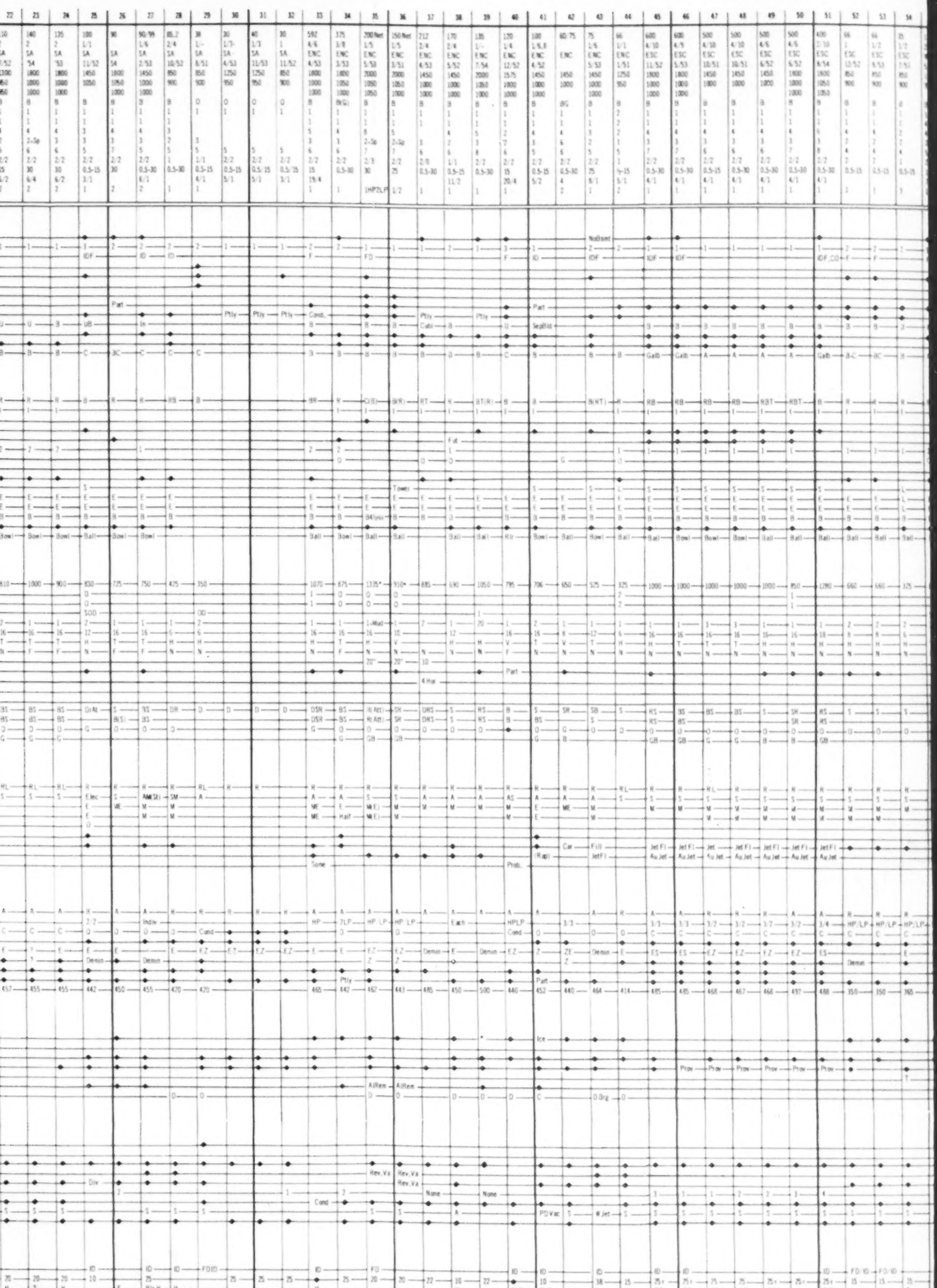
1. Continuous luminous ceiling lighting has been adopted in 47 control rooms. Other adhere to other means.
2. Incandescent lamps are the choice for 41 control rooms. There are 29 plants that have incandescents in some areas and fluorescents where they appear most appropriate. Fluorescents alone were reported for only 10 plants.

ELEC

Plant Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Total initial capability — Mw	92	75	40	360	250	200	200	150	200	125	125	100	125	90/99	90/99	75	75	66	10	200	160	110	160
Number of units (Init./Ult.)	2/4	1/-	1/-	2/6	2/4	2/4-	2/4	1/2	1/2	1/2	1/2	2/6	2/6	1/2	1/2	1	1/-	1/1	1/3	1/5	2/7	2	2
Geographical area	NE	NE	NE	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	SA	SA	SA	SA
Initial operation	11/52	54	10/52	12/52	10/53	7/52	2/52	L53	55	10/52	12/54	3/51	53	52/54	8/53	1/53	52	2/54	9/52	L53	5/51	7/52	54
Steam pressure	875	1450	1250	1800	1800	1450	1250	1800	1800	1800	2000	1250	1450	1525	1525	1000	900	900	825	1250	950	950	1000
Steam temp (Sup/rh)	925	1000	950	1000	1050	1000	950	1000	1000	1000	1000	950	1000	1005	1005	1000	900	900	825	1050	950	950	1000
" " (Reheat)		1000		1000	1000	1000		1000	1000	1000	1000		1000	1005	1005	1000				1050		950	1000
Prin Fuels — (Bit), (Anth, (Lig, (Gas, (Oil	Bit(I)	B	(B)	B(G)	B	B	B	B(G	B(G	B(G	3G	BAmax	BAmax	B(G)	B(G)	B(O)	B	A(Rx,,)	B	B	B(O)	B	B
Boilers per turbine	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1
Burners per boiler	1	1	1	1	1	1	1(Rr)	1	1	1	1	8	12	4	4	1	1	8/8(Dy	2	1	1	1	1
Pulverizers per boiler	3	4	3	5	4	4	2	4	8	4	2	2	3	4	4	4	3	4	2	8	4	4	4
Feedwater pumps per boiler	2	3	2	3	3	3	3	2+Sp	3	2+Sp	3	3	3	3	3	2	1	3	1	2+Sp	3	2	2+Sp
Extraction points	4	6	5	7	7	7	7	6	6	7	7	5	5	5	5	5	4	4	2	7	5	6	6
FD, ID Fans per boiler	2/2	2/2	1/1	4/0	2/2	2	2/2	2/2	2/2	2/1	2/0	2/2	2/2	2/2	2/2	2/2	2/2	2/2	1/1	2/3	2/2	2/2	2/2
Hydrogen cooling pressure, in.	0.5-15	30	0.5-15	15	30	30	30	0.5-30	30-45	0.5-30	30	15	15	0.5-30	0.5-30	0.5-15	15	0.5-15		30	0.5-15	15	30
Operators per shift — for — turbines	15/3		7/4	6/2	6/2	8/2	6/2				4/1			4b/2	3b/1	7/3		4/1			7/2	6/2	6,4
Outgoing transf per turbine	1	1	1	2	2	1	1	2			1	3	3	1	1	2	1	1	1	1+2	1	2	2
General Features																							
Hot/cold or lichtning for plant			1				Vert*																
Operating levels	2	1		2	1		2	1	1	1	1	3	3	2	2	2	2	3	2	1	3	1	1
Equip outdoors (Rm, (Turb, (Flans, (Cond	F	IDF		Prec.				F(B)	F(B)	F(B)		IDF	F	STF	BTF		3F	9F		F2	F		
Turbine on roof, gantry crane																							
Air preheater outdoors																							
Only control and pumps indoors																							
Station designed for quick load pickup																							
Forced-air ventilation for entire plant																							
Grating-type floors generally																							
Refuel (Above, (Under, (Beside control room	U				U	U	U	U	U	U	A	B	B	B	B			B	In	B	B	U	U
Public address system																							
Automatic oscillograph																							
Walls (Brick, (Tilen or (Cem Ast.	B	C	B	B	C	B	A	TiWet	TiWet	TiWet	B	B	B	BC	BC	A	Prot'd	C	C	B	Tile	B	B
Fuel and Fuel Handling																							
Fuel Delivery — (Rail, (Barge, (Truck, (Conv	R	B	B	B	RT	R	RBT	R	R	B(R)	BR	RT	RT	B	B	R	T	R	R	B(R)	RB	R	R
Oil Fuel: (Sys in buried tanks	F			F			I	I	I	I					F	I	I	I		I	I	I	I
Mine-mouth coal source																							
Drive-type hoist positions barges																							
Car dumper																							
Hoppers accom cars simul	1				2	1	1	1	1	1(Emer)	1	1	1			1		1			1	2	2
Coal thawed with (Oil, (Gas, (Steam	O						Fut	O		O		Hot W	Hot W			O			O		O		
Guillotine blade breaks frozen mass																							
Car vibrator																							
Unloading crane ((Gant, (Unco, (Stally		1	G	G			S			S	S			S	S					Tower	None		
Piling (Unco, (Gant, (Earth-moving	F	F					E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E
Reclaiming (Unco, (Drag, (Earthmoving	E	E			E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E
Conveyor (Belt, (Flight	B,F	B	B	B	B	B	B	B	B	B	B	B	B	S	B	B	B	B	B	B	B	B	B
Pulverizers under bunkers																							
Pulverizer type (Ball, (Steel	Bowl	Bowl	Steel	B&W	Ball		Ball	Ball	Bowl	Ball		Ball	Ball	Bowl	Bowl	Bowl	Att.	Ball	Bowl	Ball		Bowl	Bow
Steam Generator																							
Rating, (Klbs/hr	450	500	425	1170	924	675	860	1050	1450	2/875	990	880	1100	750	750	510	700	700	230	1335	500	810	1000
Boilers on steam header	2/Emer										1	5	1	O	O				2	O			
Boilers on feed water header	2/Emer										1	5	1	O	O				2	O			
Boiler OD or STD (secs)								500	500	500	500			500	500		500	500			500		
No of drums	3	1	2	1	1	3	1	1	2	1	2	1	1	1	1	3	2	1	1	1	2	2	1
Burners per boiler	4	16	4	22	16	4	8	16	32	16	4	12	12	16F*	16F*	16	12	16	4	16	16	16	16
Burners (Hor, (Vert, (Tang	T	T	H	H	H	T	V	H	T	H	H	H	H	T	T	T	H	V	H	V	T	T	T
Circulation (Natural, (Forced, (Dual	N	N	N	N	N	N	N	N	F	N	N	N	N	N	N	N	N	N	N	N	N	N	F
Pressurized furnace — In				21				10		10	10									20-5			
Divided furnace									ZFurn														
External combustor (cyclone)											E												
Stoker (Underfeed, (Spreader																							
Slide type (Damp, (Cont																							
Sight Control (Damp, (Burn, (Spray, (Cond, (Electric	DB	DBS	C	DSR	BS	BS	S	DBS	DBS	DBSR	SR	C	C	D	D	SB	C	C	D	B(Att)	BS	BS	BS
Reheat control (Damp, (Burn, (Spray, (Cond, (Electric		DBS		D	R	BS		DBS	DBS	DBSR	DR		D	B	B	SB				B(Att)	BS	BS	BS
Torch for burner ignition (Gas, (Oil	O	O	O	G			O	O	O	O	O	O	O	G	G	O	O	O	O	O	O	O	O
Television (Gauge, (Burners				GB	GB	G		GB	GB	GB	GB				B					GB		G	G
Ash Control and Disposal																							
Soot-blowers (Retract, (Lance	R	R	R	R	RL	L	R	R	R	R	R	R	R	RL	RL	R	R	R	R	R	R	RL	RL
Soot-blower oper (Air, (Steam, (Manual	AM(S	A	S	Elec	A	A	A	S	S	S	A	A	A	A	A	A	S	S	S	S	A	S	S
Dust coll (Mech, (Elec or seq	E	E	ME	ME	E	M	ME	ME	ME	ME	E	E-M	E	ME	ME	M	M		M	ME	M		
Collectors outdoors (Mech, (Elec	E	E		ME			ME	ME	ME	ME	E	E-M	E-M	ME	ME	M	M	EM		ME	M		
Combustible ash recirc into furnace																		EM					
Electronic rectifiers for precipitators																							
Dry-bottom ash sluiced to weirs	Bot											Auseq	Auseq										
Fly-ash removed contin from coll							Dry																
Ash used by cement makers																							
Heat Cycle Apparatus																							
Reheat cycle, (Adopted, (Rejected	R(Fut)	A	R	A	A	A	R	A	A	A	A	R	A	A	A	A	R	R		A		A	A
F. W. heater group by-passed (HP), (LP), (No.		3HP		2HP	2HP	HP, LP	4,3	Prs	Prs	Prs	HP	HP, LP	2/2			3HP	HP	HPLP		HP, LP	HP, LP		
Deaerating F. W. heater (Open, (Closed	O		C	O	O	O	O	Hot W	Hot W	Hot W	O	O	O			O	O	O	O	O	Cond	C	C
Feedwater sulphited																							
Makeup water (Evap and, or (Dem	E	EZ		EZ	Demin	Demin	E	Demin	Demin	Demin		EZ	EZ	E	E	EZ		EZ	Z(100%)	EZ	E	E	E
Pretreatment of evaporator makeup							Z	Fil	Fil	FZ										Z			
Regenerative air preheater							Sec																
Hot air ducts (under press) welded																							
Final feed temp at capability	407		415	470	475	450	470	500	500	500	533F	422	440	483	483	442	382	360	825	462	525	457	455
Condensing, Cooling Water																							
Recirculation provided																			No				
Basin impounds for recirculation																			cond.				
Circ pump at screen well																							
Water chlor for slime control																							
Ind Draft — (Tower or (Spray pond					T																		
Diff heat actuates screen																				A) Rea			
Deep wells (Cooling, (Drinking					D		Hix							CD	CD					D			
Condenser																							
Condenser (D) with turbine																			No				
Condenser vs turbine foundation							*												Cond				
Divided water box																			BP				
Bypass for reversed flow																			LBS	RevVa			
Two-pass to facilitate cleaning								S	Sing	Sing									Psuc				
Heaters in (Head (No.		1		3	3	4	1				2	2	2	1	1					1	1		
Deaeration in hot well																							
Hogging jet (Steam, (Air	S		S	S	S		S				S	S	S	S	S	A	S	S		S	Mech	S	S
Motorized condensate refrigeration				Elec																			
Fans and Pumps																							
Fans outdoors (FD and or ID)	FD/ID	ID						FD/ID	FD/ID	FD/ID		FD	FDID	ID	ID		FDID	FDID		FD	FDID		
Fans rated for batt overload %			25	10	10	10	25	10	10	10				16	16	33	33	20		20	15	20	20
Fan couplings (Hyd, (Elec	*		E			H	Mot					ID-E	ID-E									H	*
Air FF rated for batt overload %			25	10		20	50							16	16	33	33	20		6,5	20	25	25
Drive for turbine-oil pump (Motor or	M	M	Shaft	M	Turb	Shaft	M	M	M	M	M	M	M	T*	Turb*	M	M	M		Turb	M	Shaft	Sha
Liquid-ring regulator																							
Two-stage rotary vacuum pump																							

Continued on Reverse Side

ELECTRICAL WORLD'S STEAM STATION CHECK CHART — Design Features



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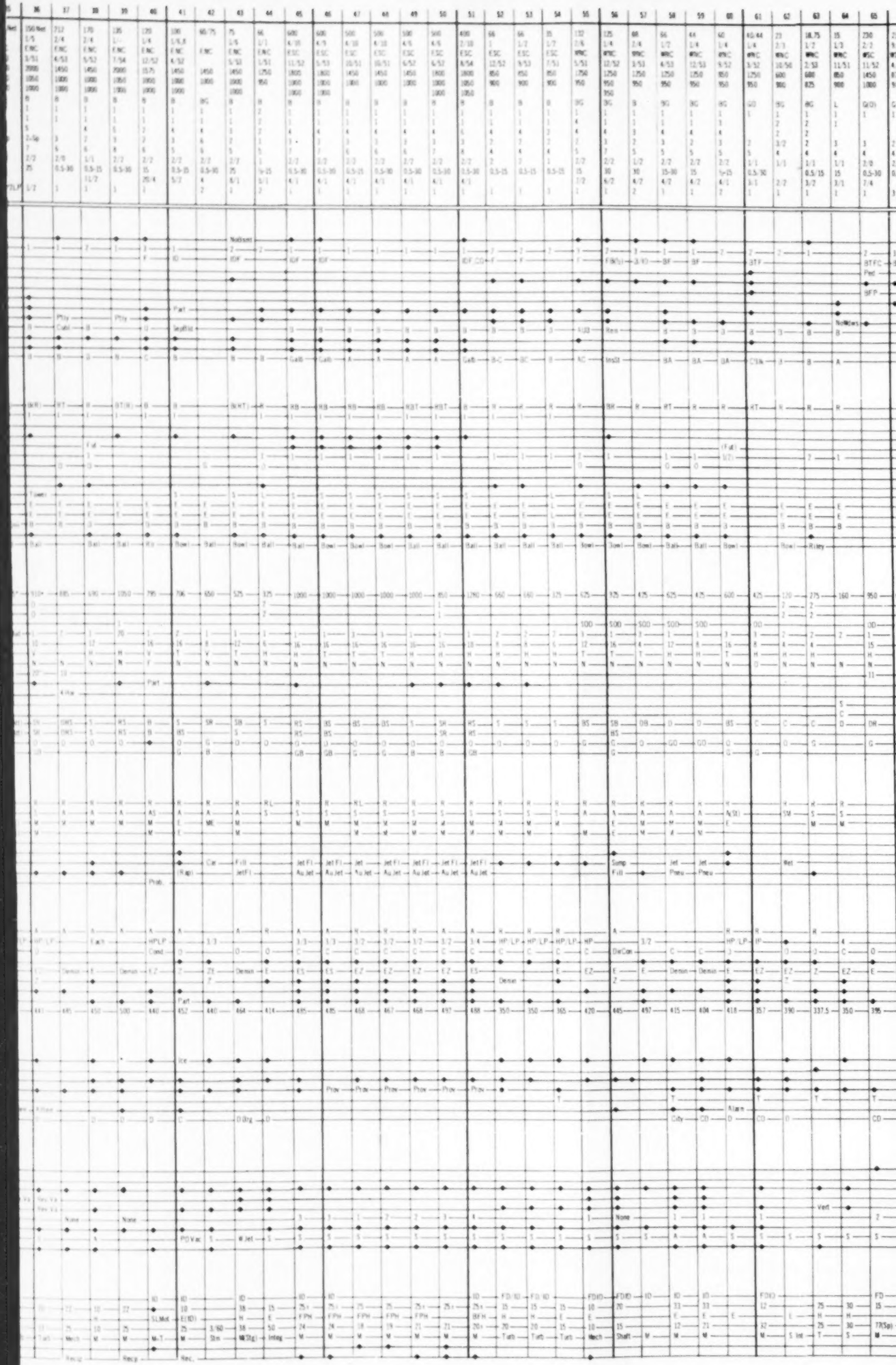
STATION CHECK CHART — Design Features of 92 New Power Plant



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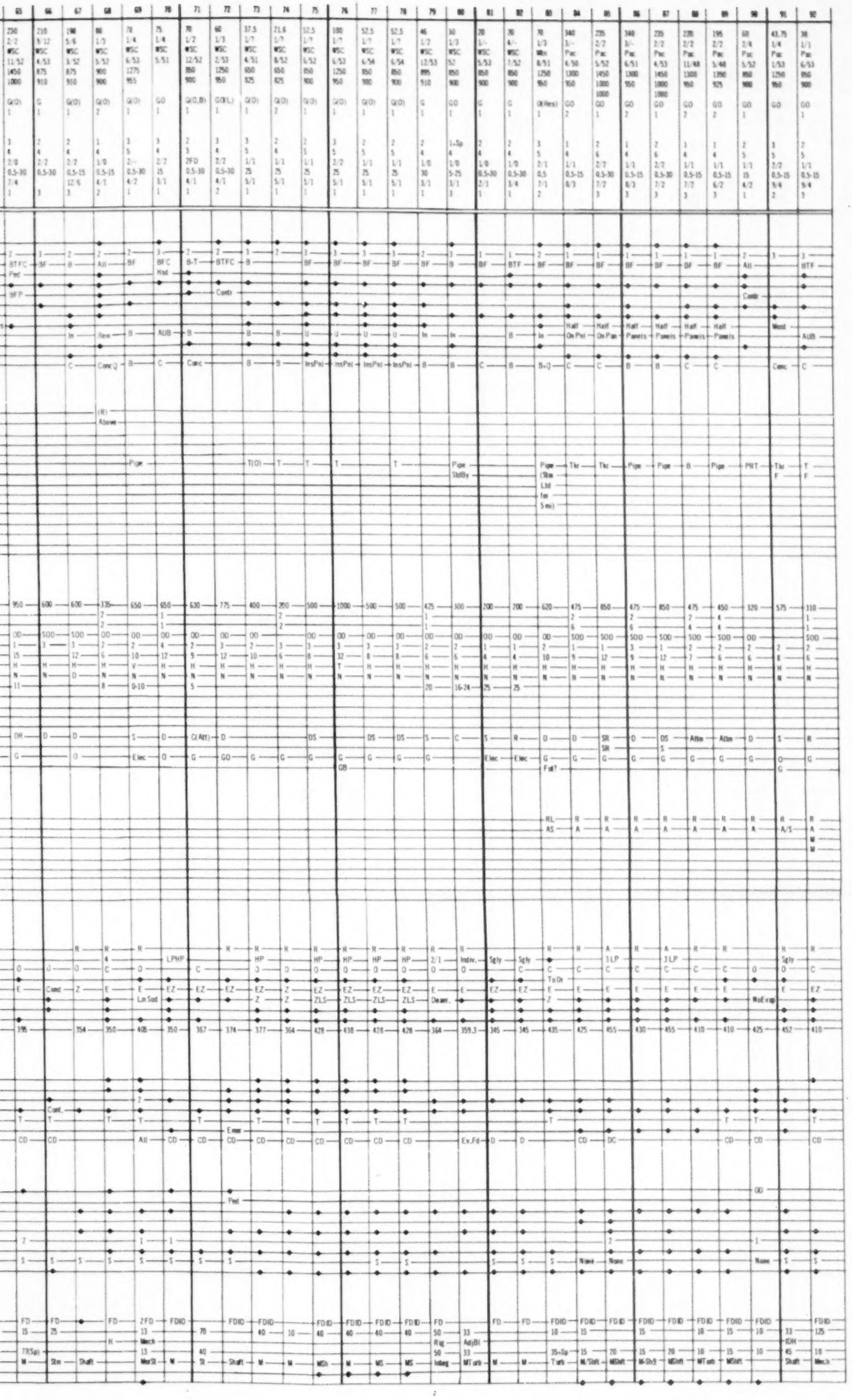
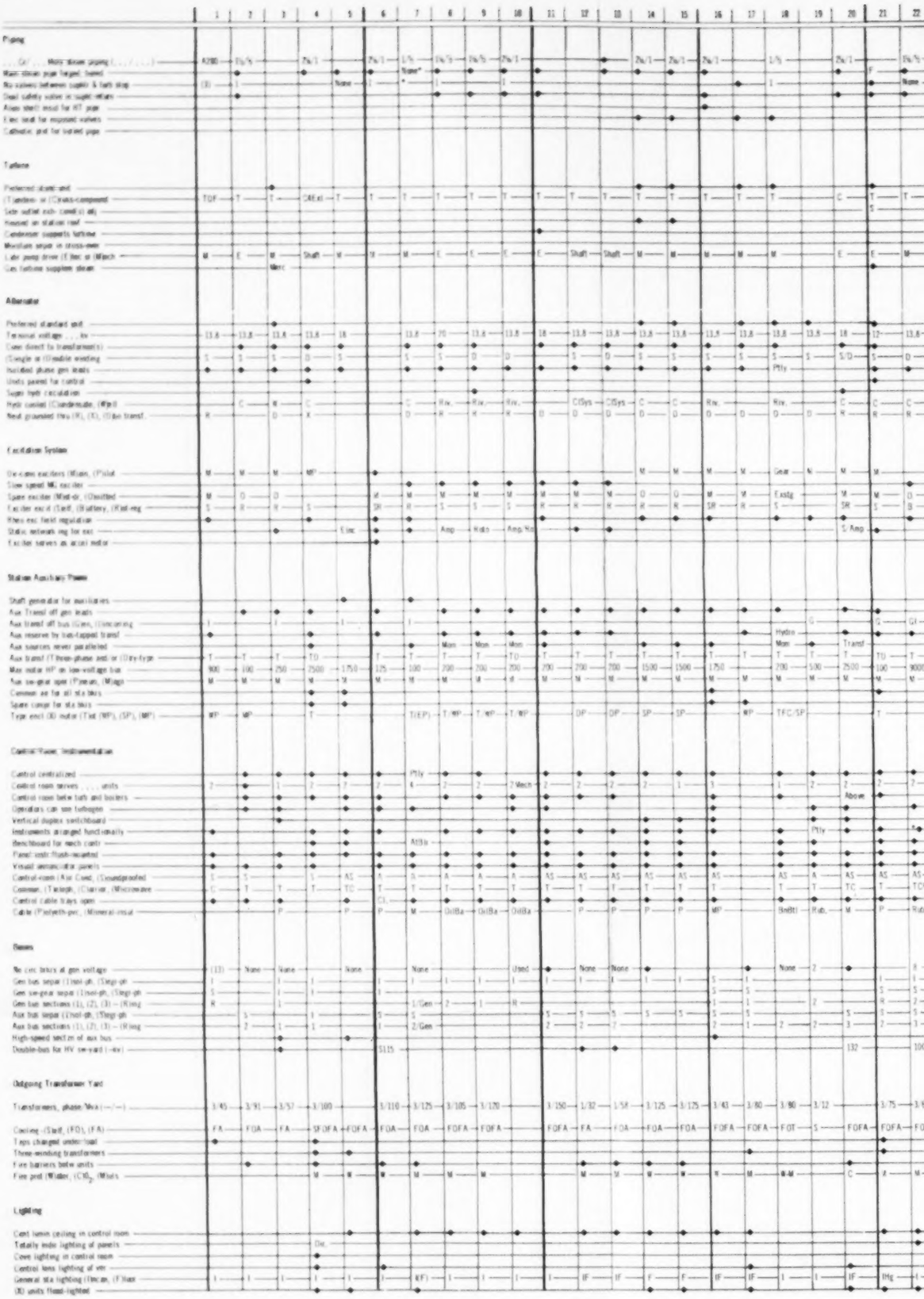
SHEET 1



Key to Abbreviations and Identity of Plants on Reverse Side



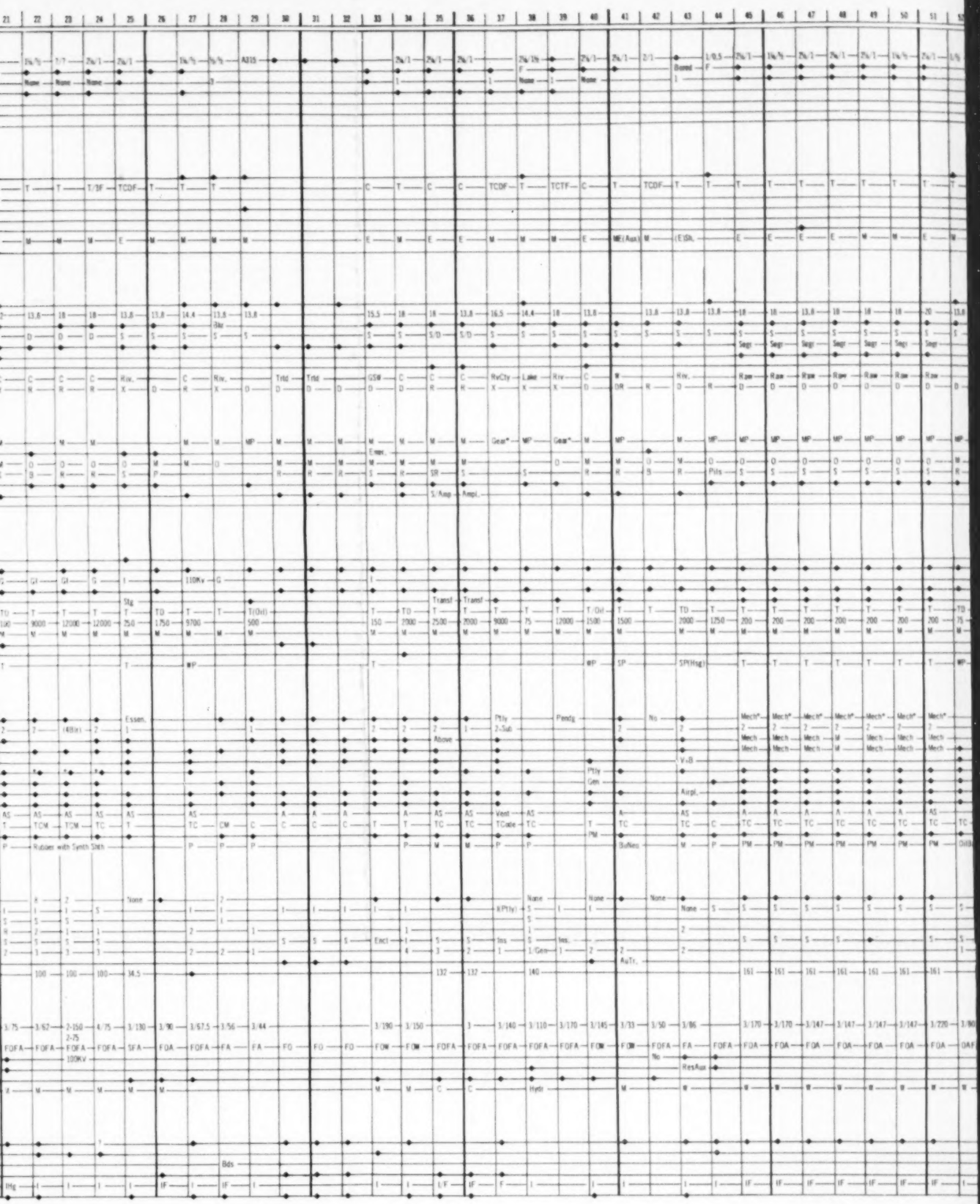
KEY TO I

No.	Utility	Plant Name
1.	Western Massachusetts Electric Co	West Springfield (No. 2)
2.	Connecticut Light & Power Co	Montville (No. 5)
3.	Public Service of New Hampshire	Schiller (No. 2)
4.	Consolidated Edison Co of New York, Inc	Astoria (No. 1 & 2)
5.	Pennsylvania Electric Co	Shawville
6.	Niagara-Mohawk Power Corp	Albany
7.	Duquesne Light Co	Elrama
8.	Philadelphia Electric Co	Cromby (No. 1)
9.	Philadelphia Electric Co	Cromby (No. 2)
10.	Philadelphia Electric Co	Delaware (No. 7 & 8)
11.	Jersey Central Power & Light Co	Raritan River (Ext.)
12.	Pennsylvania Power & Light Co	Sunbury (No. 3)
13.	Pennsylvania Power & Light Co	Sunbury (No. 4)
14.	Long Island Lighting Co	Glenwood (No. 4 & 5)
15.	Long Island Lighting Co.	Far Rockaway (No. 2 & 4)
16.	Metropolitan Edison Co	Titus (Add.)
17.	Potomac Edison Co	Albright
18.	Pennsylvania Water & Power Co	Holtwood (Ext.)
19.	Atlantic City Electric Co	Greenwich

No.	Utility	Plant Name
20.	Appalachian Electric Power Co	Kanawha River (No. 1)
21.	Delaware Power & Light Co	Edge Moor (No. 1)
22.	Duke Power Co	Riverbend (No. 4 & 5)
23.	Duke Power Co	Riverbend (No. 6 & 7)
24.	Duke Power Co	Buck (No. 5 & 6)
25.	Consolidated Gas Electric Light & Power Co	Gould Street (No. 3)
26.	Potomac Electric Power Co	Potomac River (No. 3)
27.	Virginia Electric Power Co	Portsmouth also Chesterfield
28.	Gulf Power Co	River Junction (No. 1 & 2)
29.	Florida Power & Light Co	Palatka (No. 1)
30.	Florida Power Corp	Higgins (No. 2)
31.	Florida Power Corp	Higgins (No. 3)
32.	Florida Power Corp	Suwanee River (No. 1)
33.	Detroit Edison Co	St. Clair
34.	Cleveland Electric Illuminating Co	Eastlake
35.	Ohio Power Co	Muskingum
36.	Indiana-Michigan Electric Co	Tanners Creek
37.	Ohio Edison Co	Niles (No. 1 & 2)
38.	Ohio Edison Co	R. E. Burger (No. 4)

No.	U
39.	Consumers Power
40.	Wisconsin Electric
41.	Cincinnati Gas &
42.	Toledo Edison Co
43.	Illinois Power Co
44.	Central Illinois P
45.	Tennessee Valley
46.	Tennessee Valley
47.	Tennessee Valley
48.	Tennessee Valley
49.	Tennessee Valley
50.	Tennessee Valley
51.	Tennessee Valley
52.	Kentucky Utilities
53.	Kentucky Utilities
54.	Kentucky Utilities
55.	Kansas City Pow
56.	Union Electric C

ELECTRICAL WORLD'S STEAM STATION CHECK CHART — Design Feat



TO IDENTIFICATION OF PLANTS

	Utility	Plant Name
	uners Power Co	Justin R. Whiting
	nsin Electric Power Co	Oak Creek (No. 1)
	nnati Gas & Electric Co	Walter C. Beckjord
	to Edison Co	Acme
	is Power Co	Hennepin
	al Illinois Public Service	Grand Tower (No. 3)
	essee Valley Authority	Shawnee
	essee Valley Authority	Kingston
	essee Valley Authority	Johnsonville (No. 1–4)
	essee Valley Authority	Johnsonville (No. 5 & 6)
	essee Valley Authority	Widows Creek (No. 1–4)
	essee Valley Authority	Widows Creek (No. 5 & 6)
	essee Valley Authority	Colbert
	ucky Utilities	Tyrone
	ucky Utilities	Green River
	ucky Utilities	Pineville
	as City Power & Light Co	Hawthorn
	n Electric Co of Missouri	Merimec

No.	Utility	Plant Name
57.	Minnesota Power & Light Co	Aurora
58.	Iowa Power & Light Co	Des Moines (No. 2)
59.	Iowa Power & Light Co	Council Bluffs
60.	Northern States Power Co	Black Dog
61.	Kansas Gas & Electric Co	Murray Gill
62.	Interstate Power Co	Fox Lake
63.	Iowa Electric Light & Power Co	Boone (HP)(No. 2)
64.	Otter Tail Power Co	Ortonville
65.	Houston Lighting & Power Co	Greens Bayou (HP Sec)
66.	Gulf States Utilities	Louisiana (No. 9)
67.	Gulf States Utilities	Neches (No. 6)
68.	Public Service Co of Oklahoma	Southwestern
69.	San Antonio City Public Service Board	Leon Creek (No. 3)
70.	Louisiana Power & Light Co	Ninemile Pt.
71.	Oklahoma Gas & Electric Co	South
72.	Texas Power & Light Co	Lake Creek
73.	Southwestern Public Service Co	East Plant (No. 5)
74.	Southwestern Public Service Co	Carlsbad (No. 4)

No.	Utility	Plant Name
75.	Southwestern Public Service Co	Plant X (No. 1)
76.	Southwestern Public Service Co	Plant X (No. 2)
77.	Southwestern Public Service Co	Eddy County
78.	Southwestern Public Service Co	Moore County (No. 3)
79.	Southwestern Gas & Electric Co	Lone Star
80.	Central Power & Light Co	Victoria (No. 3)
81.	Central Louisiana Electric Co	Teche
82.	Central Louisiana Electric Co	Coughlin (No. 4)
83.	Utah Power & Light Co	Gadsby (No. 1)
84.	Pacific Gas & Electric Co	Moss Landing (No. 1–3)
85.	Pacific Gas & Electric Co	Moss Landing (No. 4 & 5)
86.	Pacific Gas & Electric Co	Contra Costa (No. 1–3)
87.	Pacific Gas & Electric Co	Contra Costa (No. 4 & 5)
88.	Pacific Gas & Electric Co	Station "P"
89.	Pacific Gas & Electric Co	Kern
90.	California Electric Power Co	Highgrove
91.	San Diego Gas & Electric Co	Silver Gate (No. 4)
92.	City of Burbank, Public Service Dept	Burbank (No. 4)

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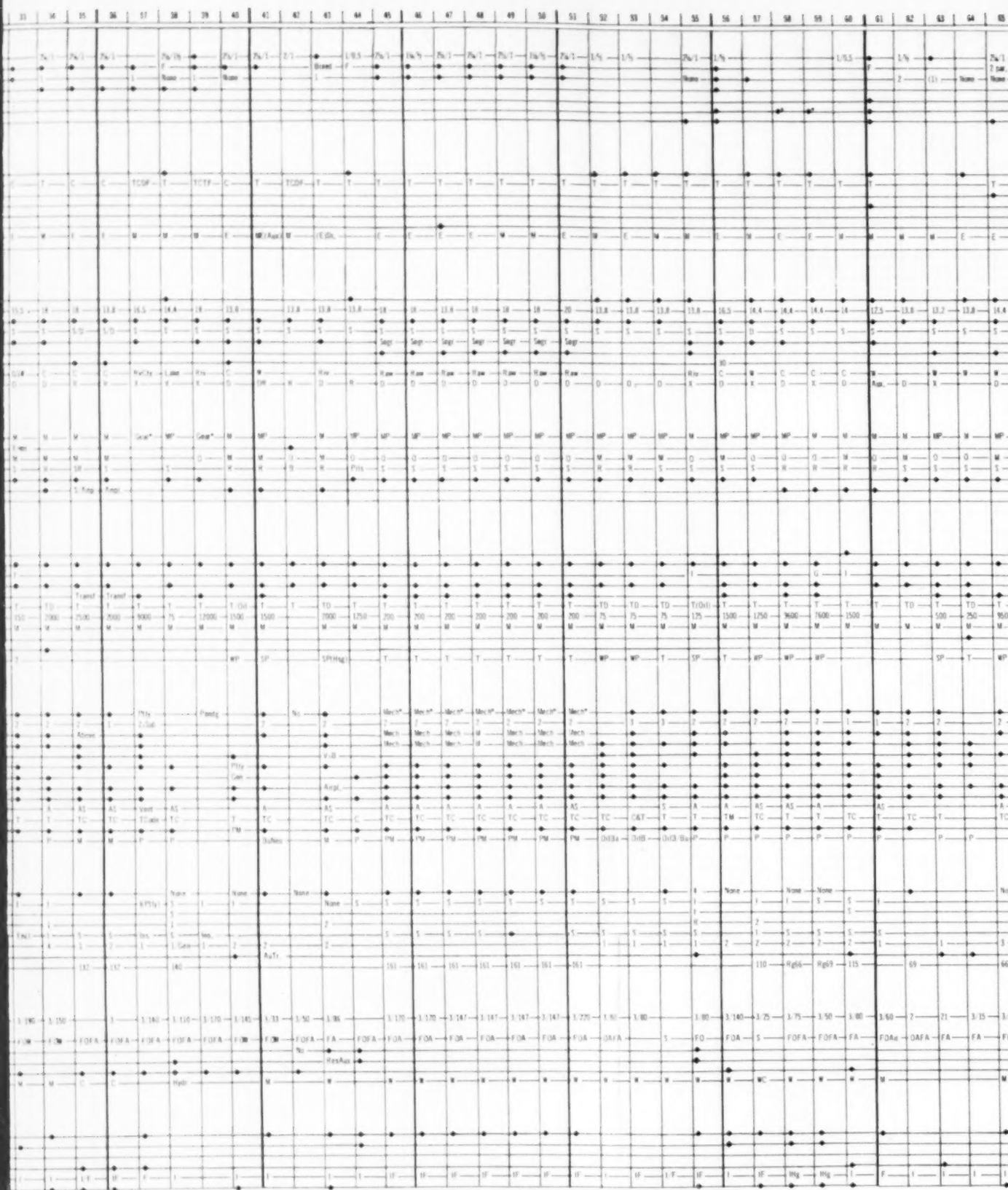
AM STATION CHECK CHART — Design Features of 92 New Power Plan



Utility	Plant Name
oer & Light Co	Aurora
Light Co	Des Moines (No. 2)
Light Co	Council Bluffs
s Power Co	Black Dog
Electric Co	Murray Gill
wer Co	Fox Lake
Light & Power Co	Stone (HP) (No. 2)
wer Co	Ortonville
ing & Power Co	Greens Bayou (HP Soc)
ilities	Louisiana (No. 9)
ilities	Noches (No. 6)
e Co of Oklahoma	Southwestern
ity Public Service Board	Loon Creek (No. 3)
wer & Light Co	Rioseito Pt.
s & Electric Co	South
& Light Co	Lake Creek
Public Service Co	East Plant (No. 5)
Public Service Co	Carlsbad (No. 4)

No.	Utility	Plant Name
75.	Southwestern Public Service Co	Plant X (No. 1)
76.	Southwestern Public Service Co	Plant X (No. 2)
77.	Southwestern Public Service Co	Eddy County
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79.	Southwestern Gas & Electric Co	Lone Star
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82.	Central Louisiana Electric Co	Coughlin (No. 4)
83.	Utah Power & Light Co	Gadsby (No. 1)
84.	Pacific Gas & Electric Co	Moss Landing (No. 1–3)
85.	Pacific Gas & Electric Co	Moss Landing (No. 4 & 5)
86.	Pacific Gas & Electric Co	Contra Costa (No. 1–3)
87.	Pacific Gas & Electric Co	Contra Costa (No. 4 & 5)
88.	Pacific Gas & Electric Co	Station "P"
89.	Pacific Gas & Electric Co	Kern
90.	California Electric Power Co	Highgrove
91.	San Diego Gas & Electric Co	Silver Gate (No. 4)
92.	City of Burbank, Public Service Dept	Burbank (No. 4)

ABBREV

Ausp	Airplane type
Al Rem	Alarm for remote control
Amp	Amplidyne
At, Attm	Attemperator
Attr	Attrition
Blr	Boiler
BP	Backpressure
Bu Btl	Buna-butyl
Bu Neo	Butyl-Neoprene
C Blk	Cement block
Cl Sys	Cooling system
Comb	Combination or combustion
Conc Q	Concrete Q
Cond	Condenser
Cont	Continuous
Cubl	Cubicle
Deaer	Deaeration or deaerator
D Wtr	Drinking and bearing cooling water
Demin	Demineralization
Div	Divided
Elec	Electronic
Emer	Emergency
Essen	Essent
Exstg	Existin
Fut	Future
Galb	Galbes
G Trn	Gas tr
Hg	Mercur
Hot W	Hotwat
Hsg	Housin
Hydr	Hydrau
Ins St	Insulat
Jet Fl	Jet slu
Mix	Mixture
Mom	Moment
No Bsmt	No bas
No Wdws	No. wi
Oil Ba	Oil-ba
One Half (1/2)	Semi (-
Parentheses	Usuall
Part, Plty	Partly
Ped	Pedest
Pneu	Pneum
Pnl	Panel

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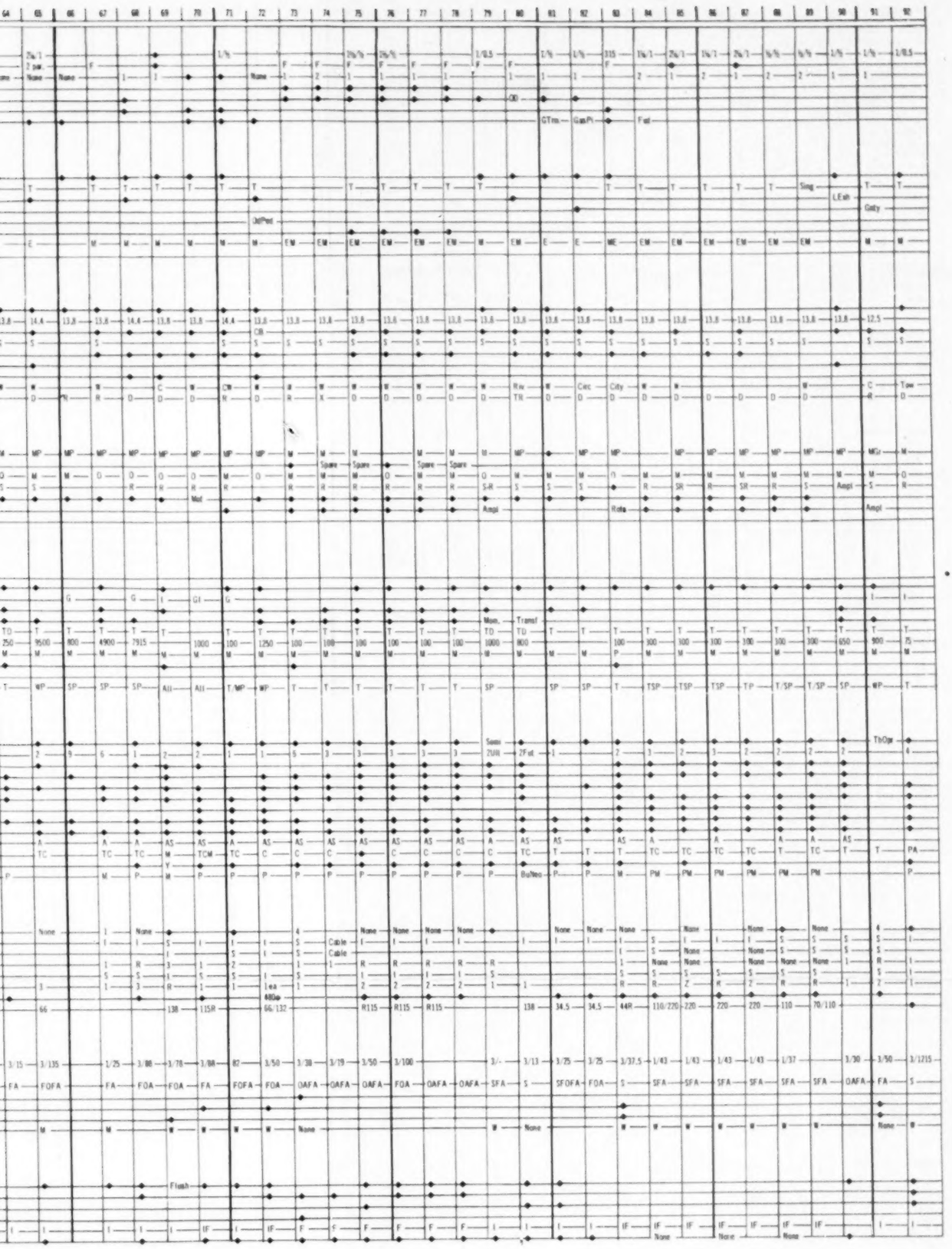
Plants

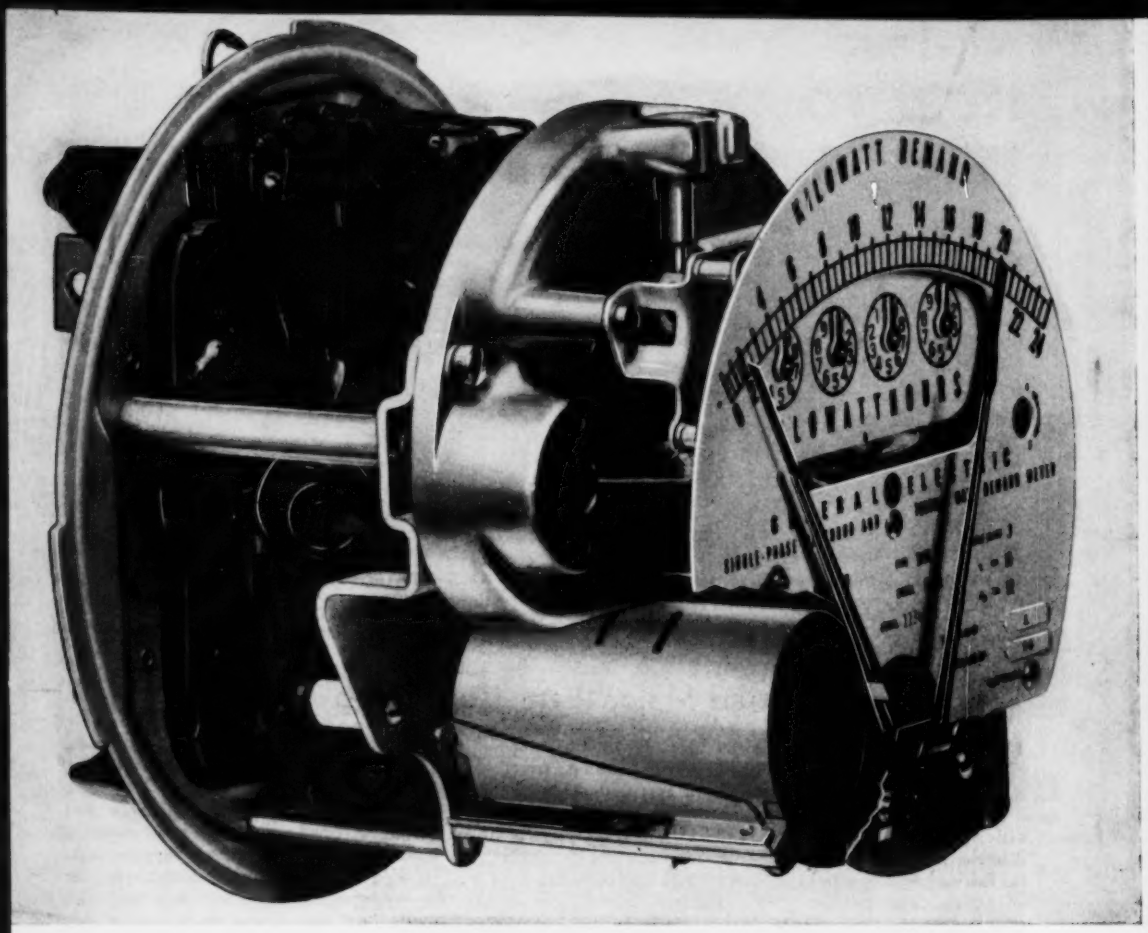


ABBREVIATIONS

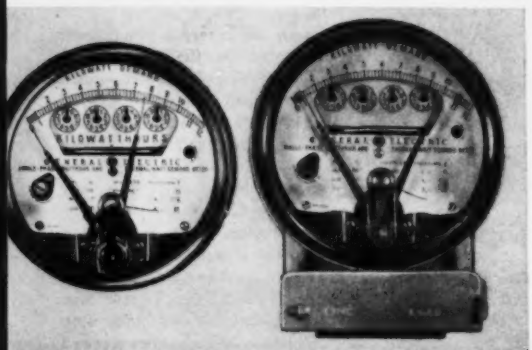
Ess	Essential
Exist	Existing
Fut	Future
Galbestos	Galbestos
Gas transmission	Gas transmission
Mercury (lamp)	Mercury (lamp)
Hotwater or hotwell	Hotwater or hotwell
Housing	Housing
Hydrant	Hydrant
Insulated steel	Insulated steel
Jet sluice to fill	Jet sluice to fill
Mixture	Mixture
Momentarily	Momentarily
No basement	No basement
No windows	No windows
Oil-base rubber insulation	Oil-base rubber insulation
Semi (-outdoors)	Semi (-outdoors)
Usually subordinate alternative	Usually subordinate alternative
Partly or partially	Partly or partially
Pedestal	Pedestal
Pneumatic	Pneumatic
Panel	Panel
Prot St	Protected Steel
Prov	Provision made
Rem	Remote control
Rev Va	Reversing valves
Riv	River
Rlr	Roller
Segr	Segregated
Sep Bld	Separate building
Sing	Single
Sp	Spare
Stdby	Standby
Stg	Starting
Stm Htd	Steam Heated
Synth Sloth	Synthetic Sheat
Tkr	Tanker
Tl Met	Tile and metal
Tow	Tower
Transf	Transfer
Two (2) Par	Two pipes in parallel
Trtd	Treated
Vent	Ventilated
Wt Dry	Wet and dry

EXPLANATORY NOTES

Plant No.	Item	Note
7	Horizontal scheme for plant	No heater Bay
7	Pulverizers under bunkers	CO_2 smothering system and dust collector on bunker
7	Condenser in turbine foundation	Elliptical, low headroom
7	No. valves between supht & turb stop	Superheater outlet connected directly to turbine stop valves
14	No. of burners per boiler	12 oil, 32 gas
14	Drive for turbine-oil pump	Oil driven booster pump
22, 23, 24	Instr. arg functionally	Functionally but not "graphically"
35	(Steam Gen) Rating, M lb/hr	1,226 Reheat
35	Pressorized furnace (in)	Also operable suction
36	(Steam Gen) Rating M lb/hr	Reheat 830
36	Pressurized furnace (in)	Also operable suction
37 & 39	Dir-conn exciters, main, pilot	Permanent magnet pilot exciter
39	Recirculation provided	Water wheel in discharge piping
45 thru 51	Control Centralized	Separate electric control room
58, 59	Elec heat for exposed valves	Also air control & operating lines and soot blower heads



Direct-heat Unit of Watthour Thermal Demand Meters Helps Assure Lower Maintenance Costs



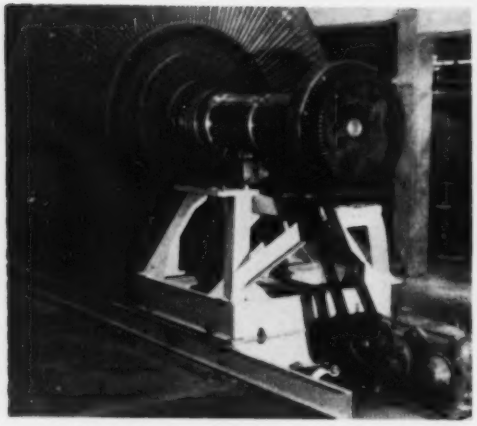
TWO TYPES AVAILABLE in three current ratings: 15- or 50-ampere meters or 2.5 amperes for use with instrument transformers.

Lower maintenance costs are assured with General Electric's Type IHM watthour thermal demand meters because the thermal element operates on a "direct-heat" principle. This produces higher efficiency and thus a greater torque which permits the use of larger, sturdier parts. It also eliminates heat transfer. Result: greater reliability.

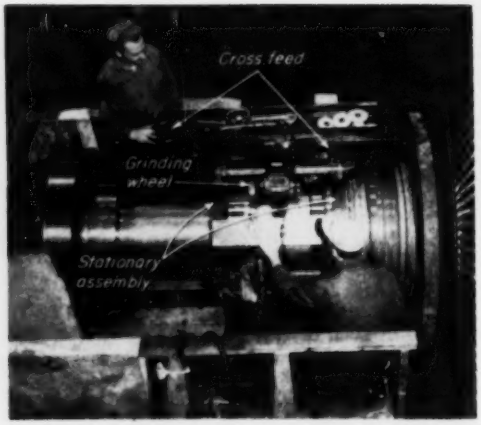
ECONOMICAL, ACCURATE MEASUREMENTS. The pointer will not overshoot on a transient load, response time can be easily predicted, and shorter testing times are possible. Type IHM meters incorporate such I-50 features as retarding magnets die-cast in the frame for added stability.

1 METER DOES 2 JOBS. Type IHM meters measure both kilowatt hours and kilowatt demand . . . and fit all standard meter installations. For complete information, call your G-E representative today or write Section 601-86 for bulletin GEC-1007. General Electric Co., Schenectady, New York.

GENERAL ELECTRIC



TEMPORARY PEDESTAL supported rotor while repair work was being done. Two groups of four bronze rollers carried spindle weight. They in turn were mounted on self-adjusting trunnion which compensated for decreasing size of journal during a cut of 0.050 in.



SHAFT-MOUNTED TURNING RIG holds cutting and grinding tools parallel to center line of shaft while journal surface of 95-ton turbine spindle was being machined. This major repair job was done at Los Angeles Department of Water and Power's Harbor Steam Plant

Special Tools Speed Major Plant Repair Job

FRANK R. GOULD, Shops Supt, General Plant Division, Los Angeles Dept of Water and Power

In-the-plant repairs made with special equipment on a 95-ton, 12-ft diameter steam turbine spindle saved the Los Angeles Department of Water and Power from sending the unit 400 miles to be repaired. In addition, it was desired to complete repairs, which involved taking a cut of 0.050 in. from the 22-in. long by 22-in. diameter spindle, before the winter peak load occurred.

Special equipment was planned and built by the Department's General Plant Division. Fabricated pedestals and temporary bearing supports were designed for the rotor to minimize friction of rotation. Supports were self-adjusting to compensate for spindle sag and for diminishing journal size during machining. Rollers were made of two groups of four bronze rolls riding on needle bearings for this purpose. Each group of four rolls was supported by a trunnion which allowed self adjustment for the size of the journal. The base of this support was machined to a spherical seat which set on a spherical cone of the pedestal, affording alignment for spindle sag.

To turn the rotor, a pinion gear was mounted on the face of the turbine coupling and connected through a V-belt and worm gear to a variable speed drive motor. To prevent rotor movement axially, a rigid support was fabricated to the pedestal, with bronze rollers snugly fit to the thrust-bearing face of the motor.

Major problem in the repair work was to make a structure sufficiently rigid to hold a cutting tool or grinder concentric with the shaft's center line.

Four semi-circular steel bands were fabricated with bronze shoes screwed

(*Continued on page* 146)

Truck Eases Handling of Heavy Pipe

Pipe handling truck enables one man to do the work of twelve when moving 24-in. sections of pipe. Truck is operated by positioning it over approximate center of balance of pipe section. Pipe is then secured with a chain and one man is then able to move pipe with a minimum effort. Truck was designed by Art Jennings of the Acme Plant of Toledo Edison Co.

Four reasons why G-E cast-in-concrete reactors outsell all others

Before choosing current-limiting reactors to protect equipment—to minimize short-circuit drop in bus voltage—or to reduce the current-interrupting duty of your breakers—take a few minutes to consider these reasons why G-E reactors are outselling all others:

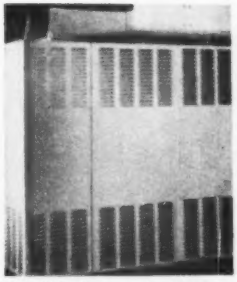
High-strength concrete supports and conductors form a one-piece structure. Special curing with wet steam under high pressure yields a concrete with several times the strength and durability of ordinary concrete.

Non-aging glass insulation offers greater protection against turn-to-turn short circuits than any other type of wound insulation used in reactor manufacture. Will not deteriorate even under high overloads. Remains unaffected by moisture.

Continually transposed conductors result in more uniform distribution of current—reduced losses and greater short-circuit strength.

Other "extra-service" features include: good clearances, elimination of through bolts, crossovers made *within* concrete supports to give maximum protection against flashover; black flameproof japan finish that provides smooth, easily-dusted surface; silver-plated terminals that insure permanently low contact resistance.

For full information on the application of sturdy, dependable cast-in-concrete reactors, get in touch with the nearest G-E Apparatus sales office. ***General Electric Company, Schenectady 5, New York.***



Metal Housings can be obtained to match your switchgear. Such housings minimize stray current and electrical losses—provide additional protection against possible damage from external causes. They also mean better appearance and increased safety for personnel.

401-96

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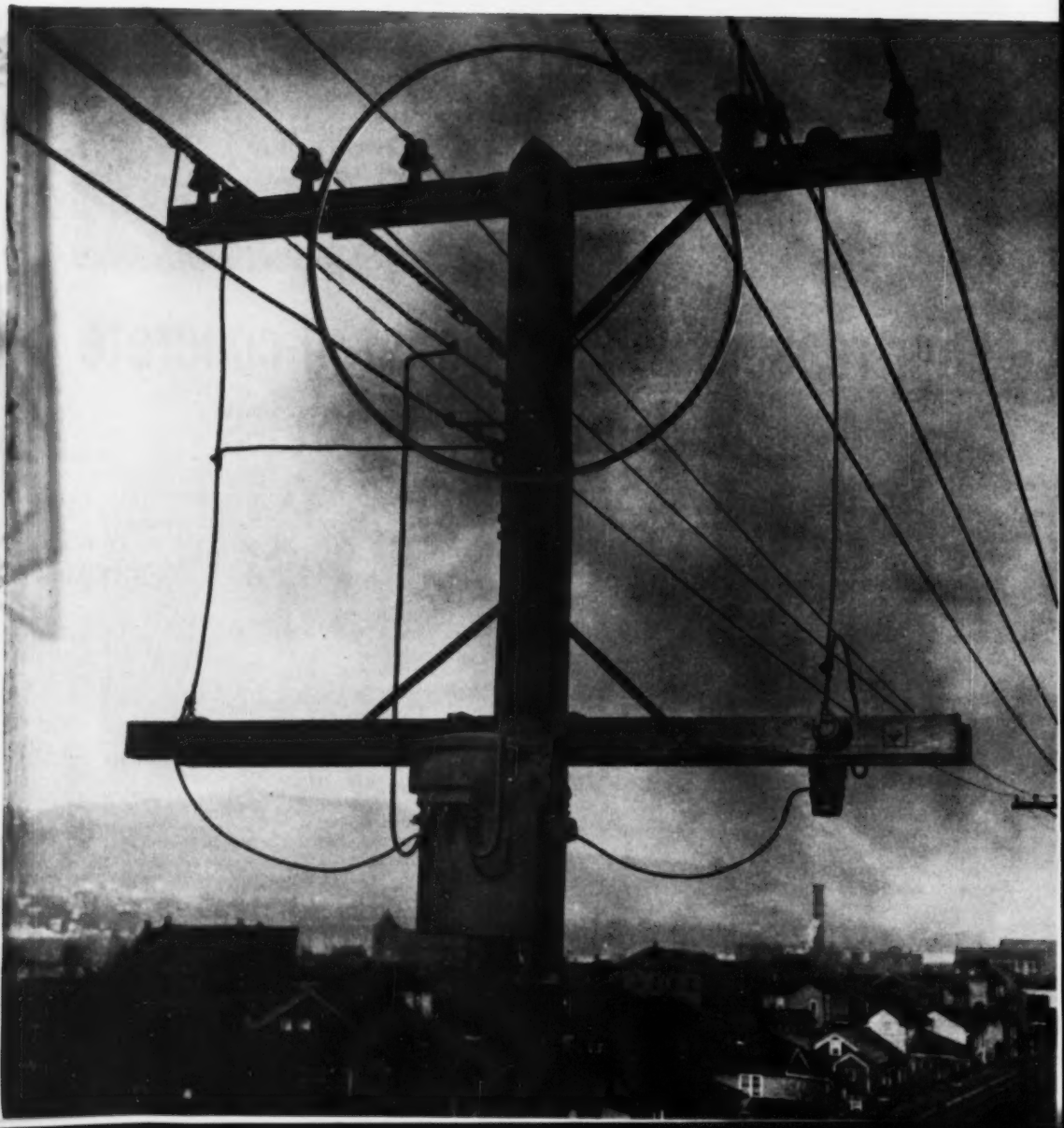
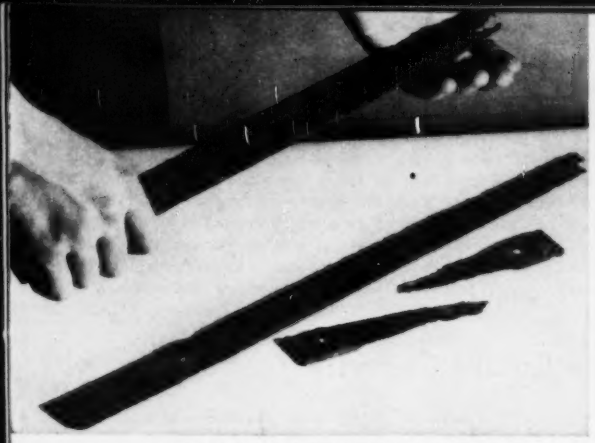
SPIRAKORE® transformers
give extra years of service

Crossarm braces eaten away but...





CORRODED CROSSARM BRACES illustrated above provide dramatic evidence of the corrosive effects of industrial smog.

TYPICAL SPIRAKORE INSTALLATION showing corrosive atmosphere successfully resisted by finish on Spirakore transformers.

finish on G-E Spirakore* transformers resists corrosive "industrial smog"

Smoke, soot, grit, and corrosive gases belching from industrial stacks in the Ohio River Valley, create an almost perpetual "industrial smog" that subjects electrical equipment finishes to continual attack.

As a result the local electric utility reports frequent instances where the corrosive atmosphere has eaten completely thru crossarm braces and other pole-line hardware. Yet, even under these conditions, the company obtains excellent service from the finish on G-E Spirakore transformers.

Spirakore finishes stand up because of the *extra* precautions we take in manufacture. We shot blast, completely, each transformer tank. And we use zinc paint *under* all parts to be welded. Then, we apply two *baked-on* coats; a rust-inhibiting primer; and a finish coat of Melaglyp, a superior synthetic resin paint made with melamine-modified Glyptal* alkyd-resin.

Just one of many Spirakore advantages. With G-E Spirakore transformers, besides better paint, you get savings in size and weight due to recent improvements in core-steel quality and construction methods. You get improved impulse strength. You get sealed-tank construction for longer transformer oil life, and improved accessibility even with complete sealing.

For complete information on these and the many other reasons why G-E Spirakore transformers give extra years of service write for Bulletin GEA-4885 and GEA-5400. *General Electric Company, Schenectady 5, N. Y.*

*Registered Trademark of the General Electric Company

BETTER FINISH on Spirakore transformers results from melaglyp paint, a superior synthetic resin paint developed in General Electric laboratories.

402-130

GENERAL ELECTRIC

Special Tools

(*Continued from page 142*)

onto the inner surface at regular intervals to act as bearings. These bronze surfaces were drilled and the holes packed with graphite grease to reduce friction. Inside diameter of bearing surfaces were machined to 0.0005-in. clearance. Shoulders were turned on shoes to limit axial movement and to fit machining of the shaft. Oil saturated felt was placed between the bronze pads for lubrication.

Halves of the steel rings were then fitted together by bolted flanges. The resulting rings, one clamped over each end of the journal, were connected by three heavy 1-in. x 6-in. iron bars and also by screws which provided adjusting for axial clearance. Shims placed in the horizontal joint gave 0.015-in. clearance on the vertical diameter.

Cross feed was mounted on one of the three cross bars, with a tool post fixture which carried either a lathe tool or grinder. Rough cuts were taken by a lathe tool, after which the journals were ground and polished.

Automatic Capacitors Increase Circuit Capacity

A. W. EDWARDS and **HAMILTON BROOKS**, Switchgear Distribution Apparatus Engineering, Westinghouse Electric Corp., East Pittsburgh, Pa.

A new packaged equipment of the open-type construction that fulfills the need for inexpensive automatically controlled capacitors has been developed by Westinghouse Electric Corp. Standard outdoor capacitor units and newly-developed oil switches are mounted together on a specially designed open rack for cross arm mounting.

The equipment is factory assembled and wired ready for installation. It is supplied for circuit voltages of 2400 to 13,800 v, and in rack capacities of 225 and 300 kvar. Smaller ratings can be obtained simply by using fewer 15 or 25-kvar units.

Simplification of wiring is attained by arranging the capacitor units in three rows, one for each phase. The 225-kvar equipment shown weighs 1000 lb. Dimensions are such that two of them can be mounted side-by-side on one pole.

Development of a special purpose oil switch permitted the range of ratings and flexibility of application. The switch, known as the type CSO-1 oil switch, is mounted with capacitors on a pole-top assembly. It has a maximum voltage rating of 15 kv and a maximum current rating of 200 amp on a thermal basis. The switch may be operated up to its thermal rating on voltages up to 7200 v. Above 7200 v, load-break duty is more severe, and current rating is reduced. A momentary current rating of 6500 amp permits two 300-kvar, 4160-v banks to be connected at the same point and switched independently.

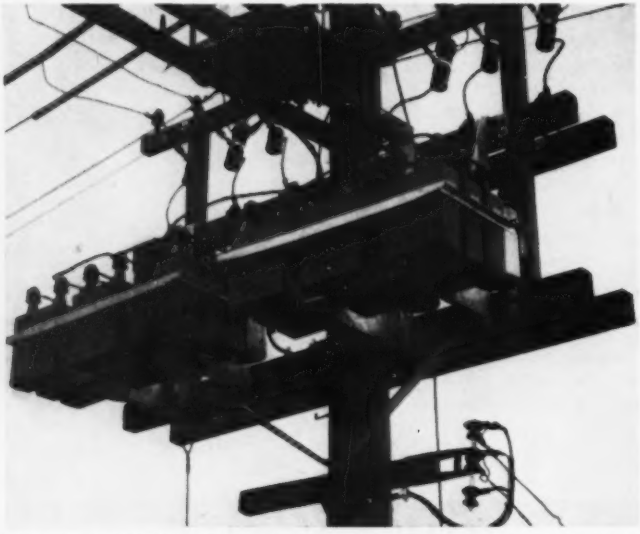
Switching of the capacitor is accomplished by momentarily energizing the operating coils of the switches. Therefore, any one of several methods may be used for initiating the operation. Requirements of this type of equipment will usually be met, however, with either a time switch or a voltage sensitive relay.

Because use of capacitors on the distribution circuit is dictated most frequently by voltage drop, voltage control is preferred for capacitor switching operations where loads are not sufficiently time-related to use time control. A new and inexpensive voltage control has been provided for this purpose. This control consists of an induction type element and a relay wired to a plug-in base and enclosed in a glass case. This device provides a complete single-step voltage control for capacitor switching.

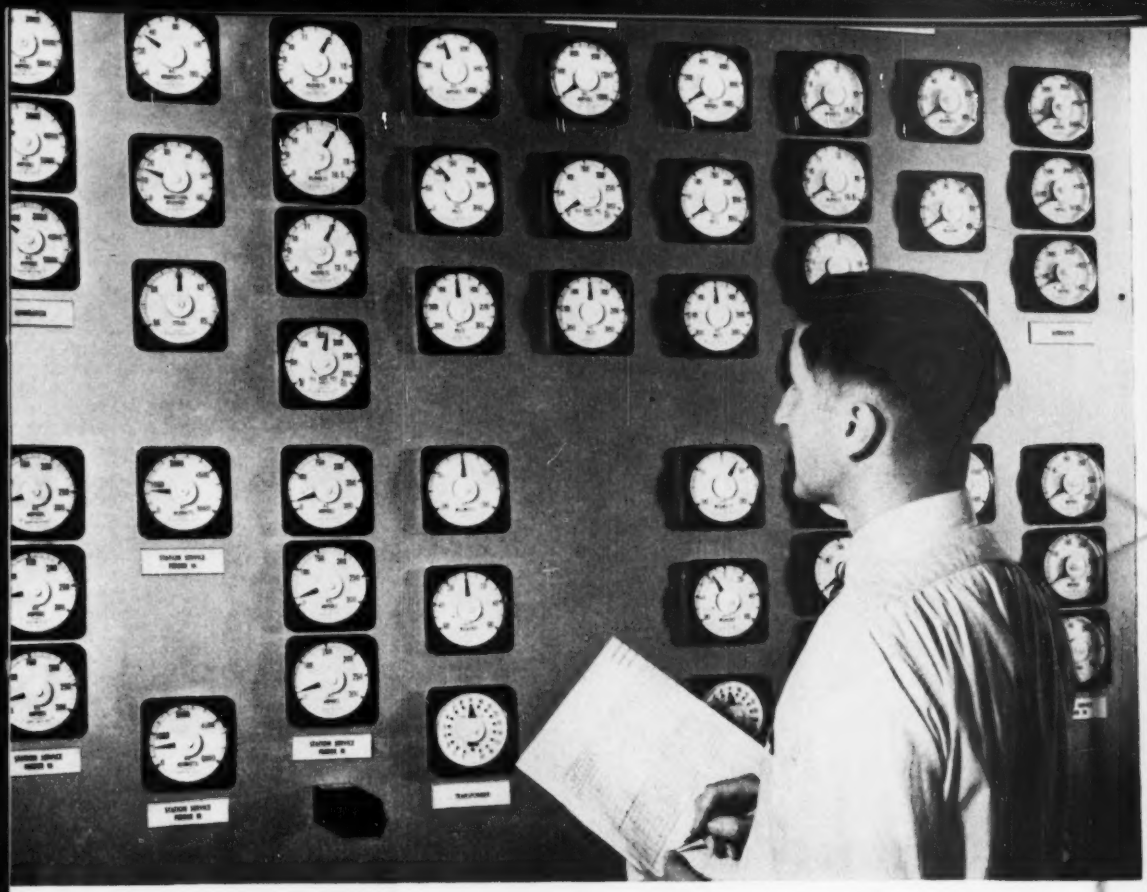
Factory assembly of the open type switched capacitor reduces the work of installation largely to a matter of hoisting the equipment into place on the cross arm and connecting it to the line. Oil switches are not designed for interruption of fault current, so fuses must be supplied for this purpose. In addition, lightning protection should be provided for the installation.

Maintenance required by the switches will depend on the capacitor current and the frequency of operation. Servicing, when required, will usually consist of changing the oil and replacing the switch contacts.

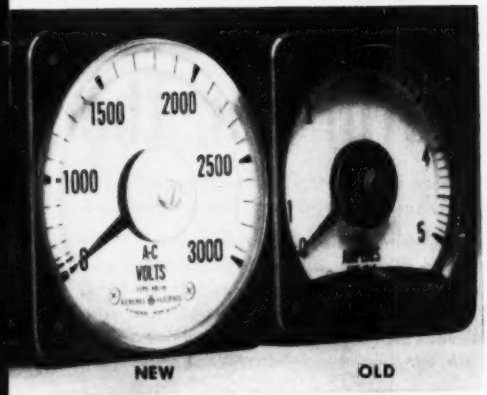
The capacitor units and rack require little or no maintenance. Corrosion resistance is obtained by galvanizing the rack and switches and heavily coating the capacitor cases with sprayed-on zinc. In addition to little maintenance, operating losses are insignificant in these installations.



SWITCHED CAPACITORS provide quick and economical expansion of capacity. Assembly for cross-arm mounting consists of standard outdoor capacitors and newly developed oil switches. Equipments are each rated 225 kvar, 2400/4160 v. Two units can be mounted side by side



See How Easily You Can Read These Instruments



COMPARE THE READABILITY and see the improvement in G-E shadow-proof instruments. Both are lighted from above. Note how much easier you can read the new dial.

That's why Delaware Power & Light recommended new General Electric shadow-proof instruments

When Delaware Power and Light built its new Edgemoor Generating Station, the company specified G-E shadow-proof instruments for the control room. They indicate performance of two generators, excitors, amplidynes, and transformers.

These instruments were selected because they are so easy to read from almost any angle. The dial is set forward, flush with the front of the case. A protruding convex-type glass front provides clear illumination. No more cover overhang; no more shadows caused by overhead lighting.

You can obtain shadow-proof instruments in both $4\frac{1}{4}$- and $8\frac{3}{4}$-inch sizes as ammeters, voltmeters, and wattmeters; frequency and power-factor meters; temperature indicators and synchroscopes.

Specify G-E shadow-proof instruments for your control stations, testing devices, and other installations. Ask your G-E representative for more information or write Section 602-211 for Bulletin GEC-218B. General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

602-211

Now a 32-step regulator for the

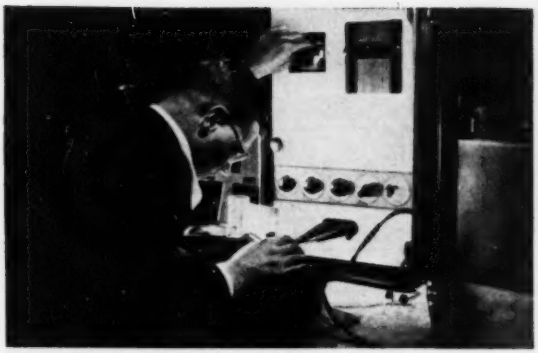
You can set new standards of service on your branch and rural circuits with this new ML32 single-phase step voltage regulator—*and at no extra cost!*

The ML32 supersedes the ML8 at no increase in price. With this new regulator, you get a twenty percent range of automatic voltage regulation—10% raise *and* 10% lower, in thirty-two $\frac{5}{8}$% steps. You get *accurate* regulation, too—new Class I accuracy controls assure at least 99% accuracy, regardless of operating changes in temperature, frequency or load.

These and other new features make the ML32 by far the best and most advanced single-phase step voltage regulator available today. Booklet GEA-5752, just off the press, gives full information. Ask your local G-E sales representative for a copy, or write to *General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

404-88



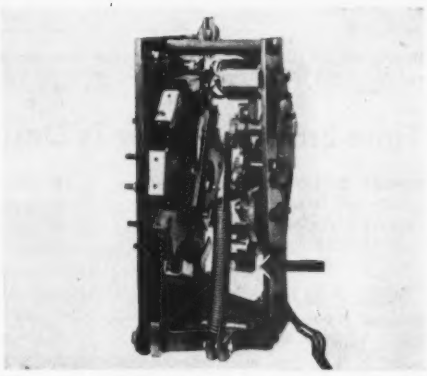
CLASS I CONTROL ACCURACY results from skilled craftsmanship and thorough testing. Here a composite test is being made of an assembled ML32 control panel. A final check is made on both the regulator and its controls after assembly.

MODERNIZED CONTROL PANEL is neat, simplified. All control knobs are conveniently located. A handy utility shelf holds meters and tools, and locks door in open position. In closed position, it may be used as an instruction book holder.

Standard Voltage Ratings

Kva Cont 55 C Rise	Cat. No.	List Price*	Load Amp at 10% Raise or Lower
RATED 2500 VOLTS (For 2500–2400-volt Circuits) (4330Y Volts)			
12.5	29D380	$1664	50
25	29D381	1885	100
37.5	29D382	2106	150
RATED 5000 VOLTS (For 5000–4800–4330–4160–2500–2400-volt Circuits) (8660Y Volts)			
25	29D385	$2193	50
50	29D386	2693	100
RATED 7620 VOLTS (For 12470GrY/7200–13800GrY/7960–11950GrY/6900–13200GrY/7620-volt Circuits)			
19.1	29D388	$2373	25
38.1	29D389	2820	50
57.2	29D390	3279	75
76.2	29D391	3715	100

For estimating purposes, multiply these prices by 0.52.



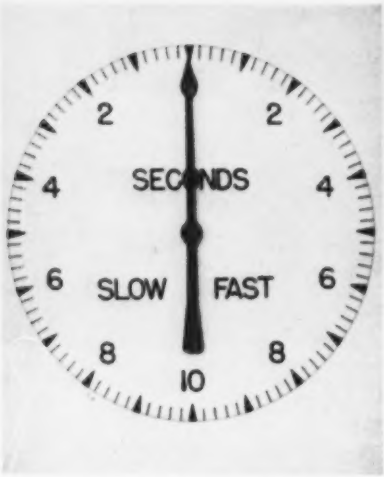
OPTIMUM-LIFE SWITCHING MECHANISM. Arrow points to new impeller that provides the optimum switching speed for maximum contact life. This improved switching design assures long contact life with fast, silent operation.

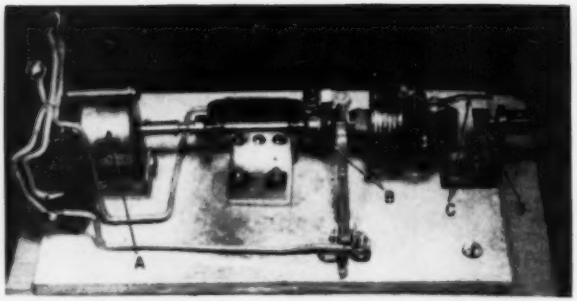
price of an 8-step!

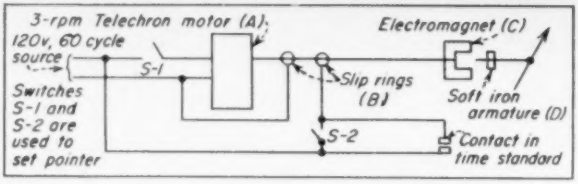
the new ML32

- **10% raise and 10% lower in thirty-two 5/8% steps**
- **Class I Control Accuracy**
- **Modernized Control Panel**
- **Optimum-life Switching Mechanism**
- **Large Magnetic Position Indicator**

LARGE MAGNETIC POSITION INDICATOR on the new ML32 has big, bright numerals and is slanted downward for ease in reading from the ground.







HOMEMADE INDICATOR shows the relation between absolute time and system time by indicating seconds fast or slow on the dial. Device has performed accurately and dependably for about six years with only routine maintenance necessary. Need arose during World War II

Time-Error Indicator is Dependable and Accurate

ROBERT D. KREIGHBAUM, Supervising Engineer, System Operating Dept, Indiana & Michigan Electric Co, South Bend, Indiana

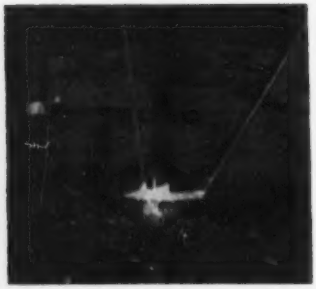
A time-error indicator which shows relation between absolute time and system time has served about six years with only routine maintenance and has proved its accuracy and dependability. Need for the indicator arose at the Twin Branch system dispatcher's office during World War II when commercial equipment for this purpose was not available. Several methods were considered but the one illustrated was selected because of simplicity, accuracy and dependability.

The time-error indicator consists of these components. A 3-rpm Telechron motor (A) operated at system frequency drives the shaft carrying two slip rings (B) and an electromagnet having U-shaped pole pieces (C). Centered between these poles is a soft-iron armature (D) attached to a separate shaft carrying the indicating pointer. The electro-magnet is energized each minute for about 1 sec and de-energized at exactly 1-min intervals from contacts in the 1000-cycle clock of the crystal-controlled time standard. This standard is independent of the frequency at which the system operates.

The point at which the electro-magnet is energized and the length of time that it is energized have no effect on the accuracy of the indicator. The point at which the electro-magnet is de-energized determines the final indication and this must occur at exactly 1-min intervals as measured by the time standard.

The friction-restrained pointer is active only while the electromagnet is energized. At such times the soft-iron vane aligns itself with the pole pieces of electro-magnet and is rotated until the magnet is de-energized. When this occurs, the pointer indicates the relation between absolute time and system time by showing the seconds fast or slow.

Prevent Corrosion With Concrete Footings



CONCRETE ENVELOPE on tower footing prevents corrosion at about $11 per footing

Use of concrete envelopes on steel tower footings has proven superior to magnesium anodes for cathodic protection on Southern California Edison's second Boulder line. The concrete protection method consists of covering the steel tower footing with a cylinder of concrete 18-in. to 24-in. in diameter. The footing is covered to a depth of at least 3 in. and extends 4 in. above the ground line. Light steel mesh is used as the reinforcing agent for the concrete.

Magnesium anodes with iron cores have been used by the company since May 1951, and experience shows that while cathodic protection is necessary, the magnesium method actually accelerates tower corrosion.

Cost of the concrete method is about $11 per footing in level country, and $18.80 per footing in rough rocky terrain. Though slightly more than the $7.50 per footing cost of using magnesium, the greater protection obtained is worth the additional cost.

Southern California Edison installed these footings on 900 towers on this transmission line.

GREATER FLEXIBILITY AND LOW COST PROTECTION WITH "SL" INTERRUPTER SWITCHES

Not just an interrupter—not just a disconnect—but a combination that breaks loads safely—and when equipped with power fuses you get full system protection.

"SL" interrupter switch with selector and grounding switch (fully interlocked)

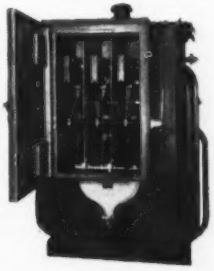
When specifications call for opening of circuits under moderate load you will find Delta-Star type "SL" interrupter switches will meet the requirements perfectly. Used with power fuses, they provide an economical means of fault protection.

Units are available in voltage ratings of 5, 7.5 and 15-kv. with interrupting capacities of 400, 200 and 100 amperes respectively. Continuous capacity of switches may be as desired since the main switch is independent of the interrupter. Furnished with or without metal housings in single, two or three pole units for mounting on transformers, walls or structures.

Load interruption is accomplished by momentarily shunting the full load current through a by-pass circuit. Here the arc is extinguished by rapidly elongating it within a confining chute. Danger of external arcing or contact burning is eliminated.

THERE IS AN "SL" INTERRUPTER SWITCH FOR EVERY APPLICATION

For complete information consult our nearest representative or ask for Publication 4612.

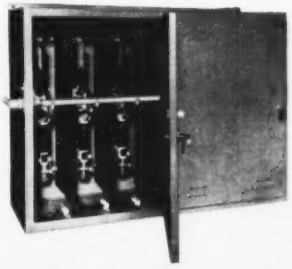


"SL" interrupter switch mounted directly on transformer

Terminators can be arranged on top or bottom of interrupter housing and furnished in several different arrangements for single feeder, looping circuits, etc. Units are easily operated by direct handle or hook-stick as preferred.

Heavy gage steel cabinets for both indoor and outdoor service

Large doors provide easy access to equipment for inspection and maintenance. Door handles on all indoor metal enclosed units are of the key type. Padlock clips are provided for locking handle in open or closed position.



Interrupter in combination with power fuses for fault protection

Each operating handle is equipped with a latch to prevent blade opening under short circuit currents. The latch is released by means of a trigger located on the operating handle and can be padlocked to prevent unauthorized operation.

WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHING EQUIPMENT SPECIFY DELTA-STAR

DELTA-STAR ELECTRIC COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

2437 Fulton Street • Chicago 12, Illinois

DISTRICT OFFICES IN PRINCIPAL CITIES

Ornamental Tree Species:

MORE COMMON ALONG OVERHEAD LINES

GEORGE B. BLAIR, Forestry Consulting Service, Jackson, Michigan

Accompanying tree list is nation-wide and covers eight species which are causing problems on overhead lines along streets and highways. Some trees manifestly have characteristics that are disadvantageous to power companies. Trimming suggestions are included

Specie[1]	American Elm *Ulmus americana*	Live Oak *Quercus virginiana*	Red Oak *Quercus rubra*	Oriental Plane *Plantanus orientalis*	Carolina Poplar *Populus deltoides*	Silver Maple *Acer dasycarpum*	Sugar Maple *Acer saccharum*	Box Elder *Acer negundo Calif.*
Form Type[2] (shape)	Upright	Spreading	Upright — spreading	Upright	Upright	Upright	Spreading	Spreading
Mature Height[3], ft.	85	50-60	70	75	80-90	75	65	55
Annual Vertical Growth Rate[4], ft	1.25	1.10	1	1.20	2.70	1.40	0.80	2
Wood Strength, mod. rupture sq. in., lb	7200	7000 approx	7000	6500 approx	4500 approx	5800	9400	5000 approx
Spacing, ft	75	90	60	60	65	70	60	45
Distinctive Features	Vase-like crown	Acorns; wide crown	Acorns	Round fruit	Cotton-like seed	Silvery appearance	Symmetrical crown	Leaflets; ridged bark
Soil Requirements	Deep, rich, moist	Rich, moist	Porous, well drained	Moist, rich	Wide variety	Best on rich bottom land	Gravelly, well drained	Drought resisting; wide variety
Suitable Location	Wide street, roadside, park	Roadside, park	Street, roadside	Street, lawn, park	Arid site, erosion control	Park, roadside	Lawn, street, park, roadside	Arid sites, street
Distribution	N.Central, N.E. Eastern states	Va., Fla. to Texas	E. States N. Central N. San Francisco	Along both coasts and inland	E. of Rocky Mt. S. to Florida	All U.S. except extreme South	N. Central and Eastern U.S.	Atlantic to Pacific, S. to middle Ala.
Vulnerability	Subject to dutchelm and other diseases. Storm resistant	Susceptible to insects	Fairly strong. Subject to oak wilt	Structurally strong. Subject to leaf diseases	Brittle wood, ice and wind damage	Weak wood. Weak crotches. Several insects	Structurally strong. Disease resistant	Weak wood. Short lived. Breakage by storms
Detrimental Characteristics	Root swell raises sidewalks	Dense shade for lawns	Acorns a lawn nuisance	Few, if any	Root suckers. Cottons, seed a nuisance	Root swell raises sidewalks. Root suckers	Good habits	Attracts insects. Bad crotching
Reproduction	Prolific seeder	Seed	Seed. Stump sprouts	Seed	Suckers. Cuttings. Seed	Seed. Stump sprouts	Seed	Heavy seeder. Stump sprouts. Cuttings
Trimming Suggestion for O.H. Lines[5]	Side and under trim	Top and through trim	Side, under and through trim	Side and through trim	Remove tree if permissible	Side, top and under trim	Top lightly; side trim	Top trim

Similar data for trees more compatible with overhead lines will appear as another Engineering Reference Sheet in an ensuing issue.

Notes:
1. No conifers are tabulated herein as such species are not frequently used in street planting.
2. General form a tree crown assumes when ample space is available for natural development.
3. A specie characteristic, deviating with soil fertility also climatic conditions of temperature and rainfall.
4. Rate of growth varies with soil fertility, and moisture supply. Induced Growth caused by excessive trimming is greater.
5. Open wire construction; cable types require less tree clearance.

NEW CLAMP

EXTENDS RANGE OF O-B CLAMPTOP INSULATORS TO FIT 1½-INCH CONDUCTORS

Large diameter aluminum conductors on feeder and sub-transmission lines in the range below 69 kv are becoming more common. To serve this trend, O-B announces a new 1½-inch clamp, applicable to all sizes of Clamptop pintypes and posts. Made of high-strength aluminum alloy, this clamp matches the conductor metal and, being non-magnetic, will not heat at high currents.

Interchangeable with either of the two clamps now being used on O-B Clamptop insulators, the new 1½-inch model retains all their advantages—no tie wires, fast installation, positive conductor anchorage, safe hot working, and freedom from radio interference.

If you plan to install large diameter aluminum conductors on pintype-insulated circuits, investigate these new O-B Clamptops —the modern successor to the tie wire.

Ohio Brass

MANSFIELD · OHIO

4319-H

Facts from
NEW YORK

" 'CSP' Transformers save us $16,000 a year"

"92% fewer outages . . . savings of approximately $16,000 a year . . . that's the record of 'CSP' Transformers compared with conventional types of transformers on our lines," says a leading utility in New York State.

"Records recently completed, covering a period of years, show that burn-outs from lightning took 0.784% of the installed capacity of conventional transformers, compared with 0.062% for the 'CSP' Transformers on our system."

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

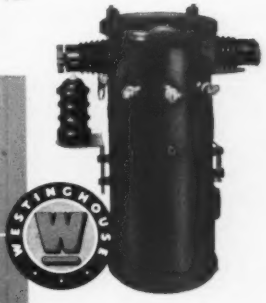
NATIONAL AVERAGES

	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse

YOU CAN BE SURE... IF IT'S
Westinghouse
"CSP" DISTRIBUTION TRANSFORMERS



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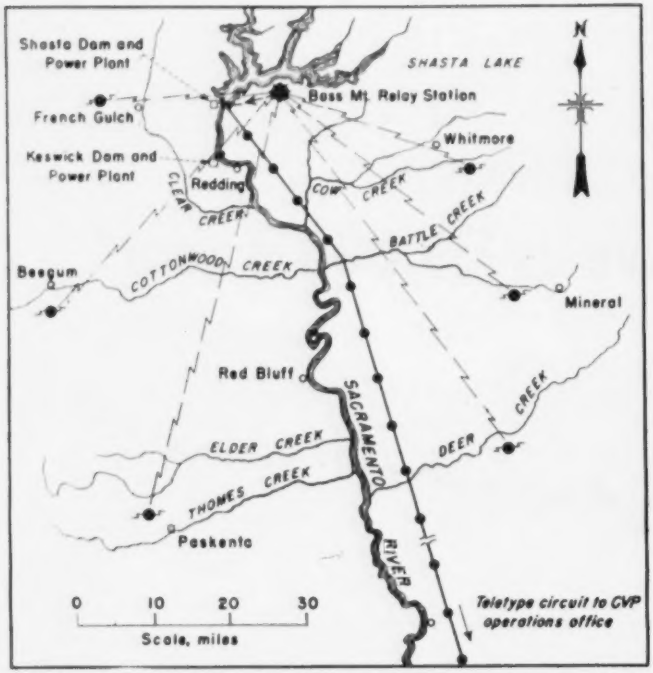


ADVANCE WARNING of flood peaks on lower tributaries of the Sacramento River is purpose of rain gage transmitting network being installed by USBR in Shasta Dam area. Automatic transmitters signal total rainfall by relay to Shasta powerhouse, where it is read on oscilloscope

Automatic Rain Gages Predict Runoff

Six automatic rain gage transmitters being installed within a 60-mile radius of Shasta Dam are expected to help the Bureau of Reclamation forecast flood peaks 12 hours in advance on Sacramento River tributaries below Shasta Dam. The transmitters will aid in controlling operation of Shasta power plant for optimum use of river channel space.

The transmitter was developed in the Bureau's Denver laboratories, and uses a small photo-electric scanning device as part of the measuring-transmitting-receiving system for this operation.

To make contact with any of the transmitters, an operator at Shasta dials a number assigned to that transmitter. Varying heights of water in the rain gage activates the sending apparatus, which beams radio impulses to a relay station on a mountain, nine miles from the powerhouse. From here it is relayed to a receiving set in the control room at the plant, and appears as a graph on the screen of an oscilloscope. Readings can then be forwarded by teletype to the Central Valley Project operations office at Sacramento where the data is evaluated.

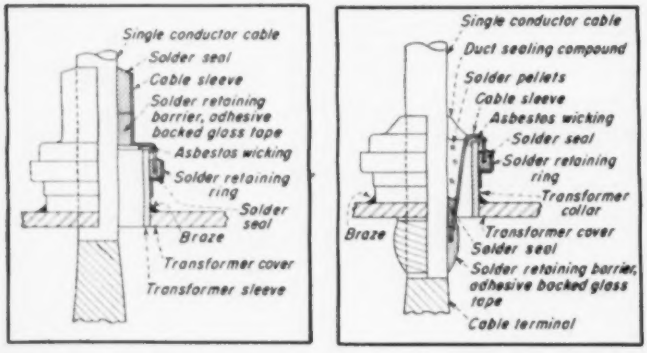
Small protective structures will house the transmitters, which will also be protected against sub-freezing weather by controlled heating. Energy for heating, as well as operation of the equipment will be supplied by storage batteries, continuously charged by wind machines. Anti-freeze solution will be used in the gages.

It is expected that this method will prove useful to the Bureau of Reclamation in future rainfall predictions for this region.

Cable Entrance Seal Eliminates Conventional Gasket Unit

VICTOR CARADONNA, Assistant Engineer, Electrical Engineering Dept, Consolidated Edison Co of N. Y. Inc

Elimination of the conventional gasket unit between the lead-covered cable and the network distribution transformer is the main advantage of a seal developed by Consolidated Edison Co of New York. This seal is used with 13-kv and 27-kv, single-conductor, paper-insulated, lead-covered cables which feed into the company's completely sealed transformers.



CABLE ENTRANCE SEAL for distribution transformers eliminates conventional gasket unit. Design (left) is for limited headroom installation; design (right), unlimited headroom

The seal is made between the cable, the cable entrance collar and the transformer cover. An intermediate cable sleeve is used between the cable and the transformer collar. This sleeve provides the solder seal between the cable and the collar which is brazed to the transformer cover by the manufacturer. Procedure for making the seal is shown in these steps:

1. Slide the intermediate cable sleeve onto the cable, large end first.

2. Locate the cable sleeve at the specified distance from the end of the cable.

(*Continued on page* 161)

Announcing

4

NEW DISTRIBUTION TRANSFORMERS

in voltages up to and including 44 Kv

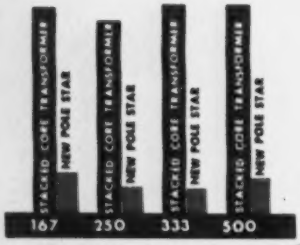
PENNSYLVANIA TRANSFORMER COMPANY • Canonsburg, Pa • *Greater Pittsburgh District*

NOW..POLE STAR TRANSFORMERS

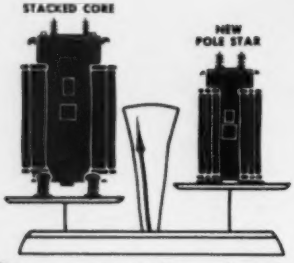
Pennsylvania's four new Pole Star distribution transformers are fundamentally the same as the original 3 to 100 Kva Pole Stars. Cores are wound of oriented electrical steel with core laminations individually lapped for low exciting current. In every Kva rating, the Pole Star is lighter in weight and smaller in size than the stacked core transformer it replaces. It is more economical to operate, less costly to store, and easier to install.

167 Kva

In Short, **The Pole Star is a Better Transformer . . . Operating with *Greater Efficiency* and at *Less Cost***



Exciting Current reduced 75%



Weight reduced 2200 pounds

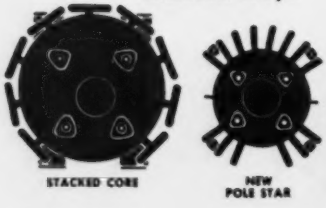
Compare

THE NEW 500 Kva POLE STAR WITH THE OLD 500 Kva STACKED CORE TRANSFORMER

Oil Volume reduced 35%

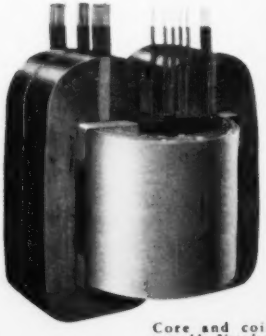
125 gallons

Floor Area reduced 20%



LOW CORE LOSS—AN OUTSTANDING FEATURE OF THE POLE STAR

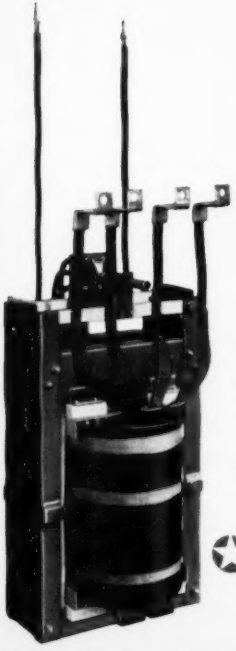
Pole Star cores are carefully annealed in controlled-atmosphere furnaces, but do not suffer the disadvantages of adhesions. That is because when the core is assembled through the coil, the laminations are separated from each other. The absence of adhesions between laminations and the presence of high interlamination resistance keep the core loss at a low value.

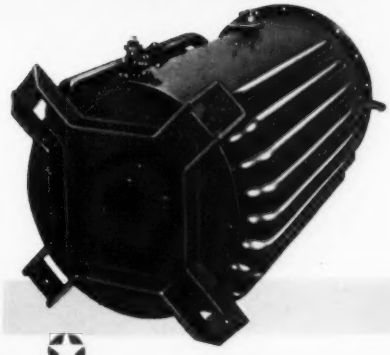


Core and coil assembly. Note lap joint at top of core.

PENNSYLVANIA TRANSFORMER

IN SIZES UP TO 500 Kva





NEW BASE FEATURES CROSS VENTILATION

Structural steel bars are welded to the tank bottom. Their arrangement permits the transformer to be rolled in any direction. Jack lugs extend beyond the tubes or radiators. Openings provide cross ventilation for the tank bottom and the base. The entire tank bottom is accessible through the openings for painting.

INTERNAL ASSEMBLY OF 167 KVA POLE STAR

Side frames completely enclose the core and provide a sturdy support for the entire unit. The Pole Star coil is designed for a low temperature gradient and a high overload capacity. Large oil ducts are provided throughout the coil.

CORE BUILDER ASSEMBLES LAMINATIONS THROUGH 500 KVA POLE STAR COIL

Core laminations are individually lapped. There are no gaps or butt joints in the Pole Star core to cancel out the advantages of the cold-reduced, oriented electrical steel. The lapped construction reduces the flux density at the joint and maintains the low reluctance path of the Pole Star core.

COMPANY **Product Of Long Experience Safe, Thrifty And Reliable**

YOU WILL BENEFIT IN FOUR IMPORTANT WAYS IF YOU INSTALL POLE STAR TRANSFORMERS ON YOUR LINES

1 YOU WILL GET BETTER PERFORMANCE *Because*

Pole Star transformers have a reduced core loss and therefore operate at higher efficiency. The Pole Star core uses to best advantage the superior magnetic qualities of cold-reduced oriented electrical silicon steel.

2 YOU WILL GET BETTER VOLTAGE REGULATION *Because*

Impedances have been reduced. Better customer relations will result since lower impedances mean less voltage fluctuation during load changes, and less voltage drop during peak loads.

3 YOU WILL SAVE MONEY *Because*

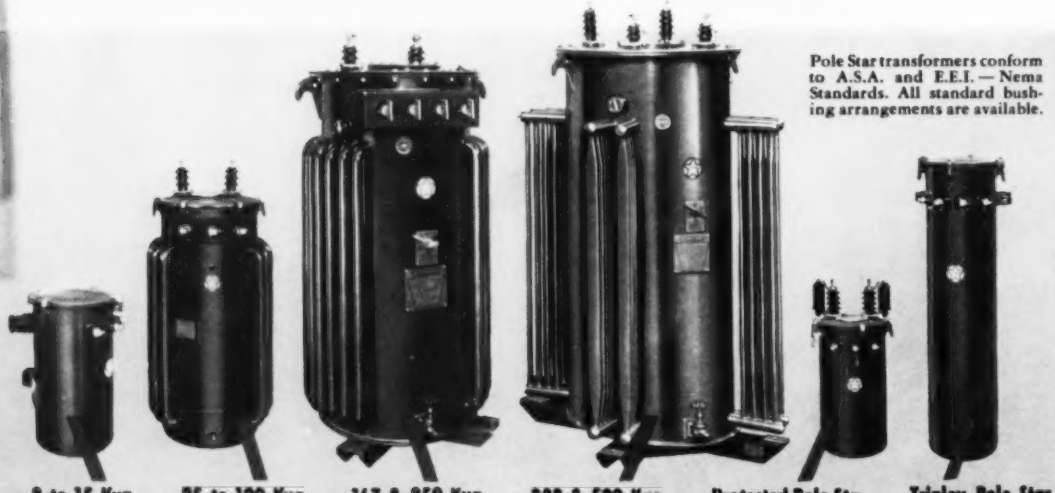
Pole Star transformers have lower exciting current — *the current needed to magnetize or excite the core.* Since it is always present — under *any load* or *no load* conditions — a certain amount of generating Kva must be earmarked for exciting current and nothing else. In terms of hundreds of transformers, this generating Kva can mount up to large amounts of generating capacity, supplying nothing but exciting current and returning no revenue to the utility.

It is good business, therefore, to install Pole Star transformers on *your* lines. Under *no load,* less generating capacity would be required. At *full load,* the utility will derive more output per unit of generating capacity. By installing Pole Star transformers with low exciting current, real dollar savings can be achieved.

4 YOU WILL BE USING SMALLER TRANSFORMERS *Because*

Pole Star transformers from 167 Kva through 500 Kva are as much as 28% lighter and 30% smaller in size. This means you will get *more Kva per pound* when you install Pole Star transformers on your lines. It further means that when you must replace your old transformers because of heavier loads, you can install larger Kva-rated Pole Stars with little or no increase in size or weight.

NOW...A Pole Star Transformer in every Distribution size:



Pole Star transformers conform to A.S.A. and E.E.I. — Nema Standards. All standard bushing arrangements are available.

3 to 15 Kva
Voltages up to 14,400 volts

25 to 100 Kva
Voltages up to 22,900 volts

167 & 250 Kva
Voltages up to 43,800 volts

333 & 500 Kva
Voltages up to 43,800 volts

Protected Pole Star
Pennsylvania's CSP Transformer
3 to 100 Kva

Triplex Pole Star
Vertical-type three-phase
9 to 150 Kva

For complete information on the 167 to 500 Kva Pole Stars, write to Pennsylvania Transformer Company, Box 330, Canonsburg, Pa. Ask for Catalog No. 352.

POLE STAR

Pennsylvania TRANSFORMER COMPANY

BOX 330, CANONSBURG, PA. *Greater Pittsburgh District*

Cable Entrance Seal

(*Continued from page* 156)

Wrap adhesive-backed glass tape around the cable up to the diameter of the cable sleeve and over the outside of the sleeve to form the solder retaining barrier. This barrier shall remain on the terminal when inserted in the transformer.

3. Support the terminal in a vertical position outside the transformer. Pour sufficient solder pellets into the cable sleeve to form a solder seal ¾-in. deep and add powered flux. Heat by torch until pellets are completely melted and puddle the molten mass to assure a void-free and pressure-tight seal.

4. Construct and complete the cable terminal in accordance with company specifications for the voltage rating of the particular cable.

5. Insert one turn of ⅛-in. asbestos wicking inside bend of the cable sleeve.

6. Slide the solder retaining ring over the transformer collar.

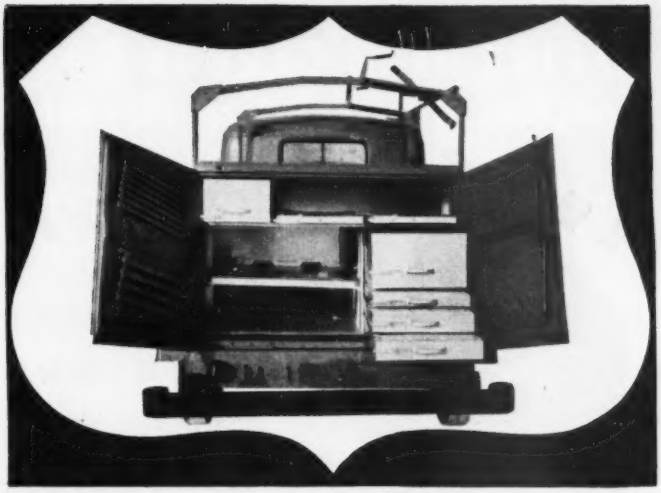
7. Insert completed terminal in the transformer through the transformer collar and bear down on the cable sleeve evenly to compress the asbestos wicking. This asbestos wicking gasket serves to prevent the accidental entrance of solder in the transformer.

8. Pour sufficient solder pellets into solder seal retainer to form a solder seal that extends ⅜ in. up on the cable sleeve. Add powered flux. Completely fill with solder pellets the pocket above the solder seal between the cable sleeve and the cable to absorb the heat that may penetrate to the inside solder seal when the outside seal is cast. Heat by torch until the solder pellets in the retainer are completely melted. Puddle the mass to obtain a void-free and pressure-tight seal.

9. Cover the pellets between the cable and the cable sleeve to the top of the sleeve with a duct sealing compound to prevent the accumulation of dirt, mud and water which in time may cause corrosive damage.

This design (illustration, left) utilizes the cable sleeve in the inverted position with the tapered end down in the transformer. It reduces the over-all height to a minimum where the headroom in manholes and vaults is limited.

Unlimited headroom allows a change in shape (illustration, right). Here the cable sleeve is soldered to the



HIGHWAY
Installer's Unit
Compact arrangement-
Rugged Construction

The thousand-and-one pieces of material and tools that your installation, maintenance and servicemen need on the job are all at arm's reach in this compact, versatile Highway body. Designed, engineered, and Highway-built from the experience of thousands of installers and servicemen, it is scientifically arranged to place everything that the man-on-the-job needs at his finger tips. That's why this Highway IU-76 Installer's unit has become the standard of the industry.

The rear and side doors open to place at the disposal of the installer all the materials and tools he desires—drop wire reel, ladders, tree trimming equipment, wire and cords, screws, clamps, fuses, and all the other things that he must have on the job to avoid an unnecessary trip back to the shop. The workmanship on this body equals its efficient arrangement.

It has the rugged built-in strength to give years of service in all weather, on all roads.

Send today for your complete Highway catalog of public utility equipment. Or, call or visit the friendly Highway Distributor or Factory Branch nearest you.

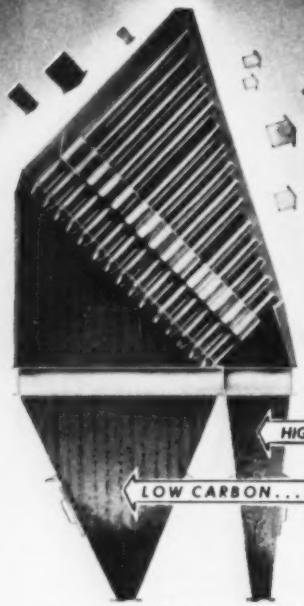
HIGHWAY TRAILER COMPANY

Headquarters: Edgerton, Wisconsin

PLANTS AT EDGERTON, WISCONSIN — STOUGHTON, WISCONSIN

The nation's largest Manufacturers of Utility Truck Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories

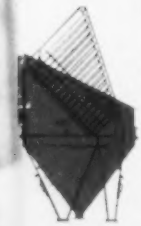
REFIRE HIGH CARBON DUST
without recirculating fly-ash



. . . install **pd**

TUBULAR DUST COLLECTORS *arranged for* DECANTATION

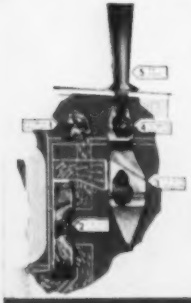
In a single phase P-D tubular collector, designed for decantation and *requiring no additional pressure drop*, it is now possible to separate the large particles of high carbon content from the non-combustible finer particles.



Fly-ash from spreader stoker-fired units, consisting of up to 40% high carbon particles, can effect considerable savings when re-injected. It is necessary to effect separation, however, since the non-combustible smaller particles remaining in the system increase in concentration, causing erosion and possible poor combustion due to spotting.

Space requirements for the decantation design are not as great in area and only slightly higher than a standard tubular . . . and, collection efficiency is high. Superimposed sketch shows comparative size.

Why waste fuel? Investigate this collector today, it will soon pay for itself. Write our Sales and Project Engineers for Bulletin 260 D.



UNIT RESPONSIBILITY

Prat-Daniel, through its sales and project engineers, The Thermix Corp., offer a complete complement for handling the air gas stream: Forced Draft Fans, Air Pre-heaters, Tubular Dust Collectors, Induced Draft Fans and Fan Stacks. This unit responsibility, by a well known firm, relieves the engineer of the responsibility for one of the most important functions in a steam generating plant.

Sales and Project Engineers

THE THERMIX CORPORATION
GREENWICH, CONN.

Canadian Affiliates: T. C. CHOWN, LTD.
1440 St. Catherine St. W., Montreal 25, Quebec
50 Abell St., Toronto 3, Ontario

Designers and Manufacturers

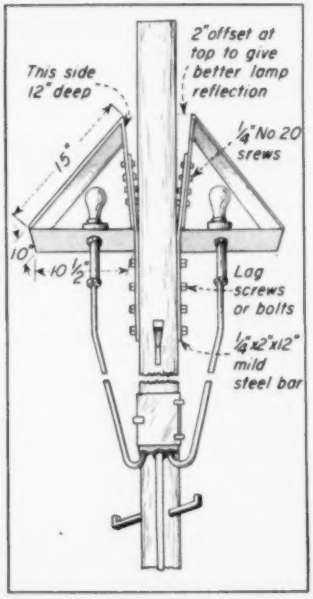
PRAT-DANIEL CORPORATION
SOUTH NORWALK, CONN.

cable with the smaller end above the transformer sleeve. The lip formed at the outer edge bears on the transformer collar similar to the former design and the upper end is finished off to a straight sleeve. The solder retaining barrier is formed around the cable inside the sleeve at the bottom and the solder seal is made at the top between the cable and the sleeve.

Car-Dumper Signal Lights Visible in All Weather

MARK HORN, Electrician, Philo Plant, The Ohio Power Co, Philo, Ohio

Two signal lights devised and erected about 18 months ago at Philo coal-yard car dumper can be seen plainly in either sunshine or fog. A distinctive signal light was necessary which would be visible in all kinds of


This side 12" deep
2" offset at top to give better lamp reflection
15°
¼" No 20 screws
10"
10 ½"
Lag screws or bolts
¼" x 2" x 12" mild steel bar

SIGNAL LIGHTS to aid men working coal cars and car dumper are visible in sunshine and fog. Sheet iron housings protect lights

weather to men bringing cars into the dumper and to men on the empty car tracks. Since the installation no trouble has been experienced.

The Philo fixtures are made of sheet iron, covered with a rust-preventive primer and bitumastic, and painted inside with aluminum and a black

(*Continued on page* 165)

HIGHER PUNCTURE VOLTAGE VALUES WITH

VICTOR PURIFIED PORCELAIN

VICTOR NO. 900
SUSPENSION INSULATOR

Laboratory tests prove VICTOR *PURIFIED* PORCELAIN has 18% higher mechanical impact values, an improvement of 24% in the range of M & E strength values and oil puncture values that are remarkable (See charts at right!)

Secret of VICTOR *PURIFIED* PORCELAIN is the removal of mineral salts from water used in processing. Years of research in this field have reduced fluctuations in shrinkage and density and practically eliminated the formation of microscopic, glass-like impurities which, up to now, have prevented attainment of maximum strength and hardness. Result—the finest insulator porcelain ever made!

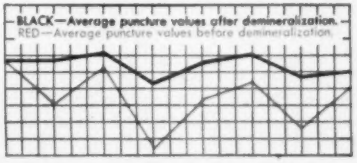
VICTOR INSULATORS, INC. • VICTOR, N. Y.

Specify VICTOR SUSPENSION INSULATORS

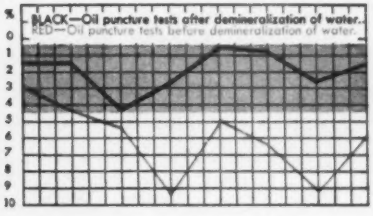
HERE'S PROOF!

Shown below are records of tests made on VICTOR 10" 15,000 lb. Suspension Insulators picked from production runs. These charts show test results of puncture under oil before and after demineralization of water. The first shows average puncture values of tests made and reveals a 7½% increase of average puncture values after water demineralization. The second shows percent average deviation of puncture values.

TEST RUNS OF PUNCTURE UNDER OIL



Average Puncture Values of Tests Run



Percent Average Deviation of Puncture Values

pick the brush Killer that's proved for the job!

When you pick a product for brush control, you can't afford to test 50 or more formulations to determine which one is best for the job. *But we did*—in cooperation with public utility companies, highway departments, railroads and spray service organizations. These tests on many species of brush in all sections of the country at all seasons of the year *proved* that Esteron* Brush Killer and Esteron 245 should be your first consideration in any successful brush control program. Here's why:

Both contain highly effective low volatility propylene glycol butyl ether esters which have been proved by actual use over thousands of miles of right-of-ways. Esteron Brush Killer, a mixture of the 2,4-D and 2,4,5-T esters, is widely used for control of mixed stands of brush. For certain resistant species that need a straight dose of 2,4,5-T—Esteron 245 is the ticket! It is successful also for year-around basal bark and stump treatment.

Both products have excellent storage qualities.

Yes, good results depend on the brush killer you use and how you use it. Pick the one that's *proved* for the job! You are invited to call on Dow sales and technical men for consultation on your brush control problems.

*ESTERON is a registered trade mark of The Dow Chemical Company, largest producers of weed, brush and grass control chemicals.

ESTERON BRUSH KILLER and ESTERON 245

CONTAINING NEW LOW-VOLATILITY ESTERS

THE DOW CHEMICAL COMPANY

Agricultural Chemical Department • Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Signal Lights

(*Continued from page* 162)

border. Open ends of the fixture face north and south to shield the 100-w yellow bulbs and reflecting surfaces from direct sunshine. Angle of the fixture is all important for satisfactory discernment.

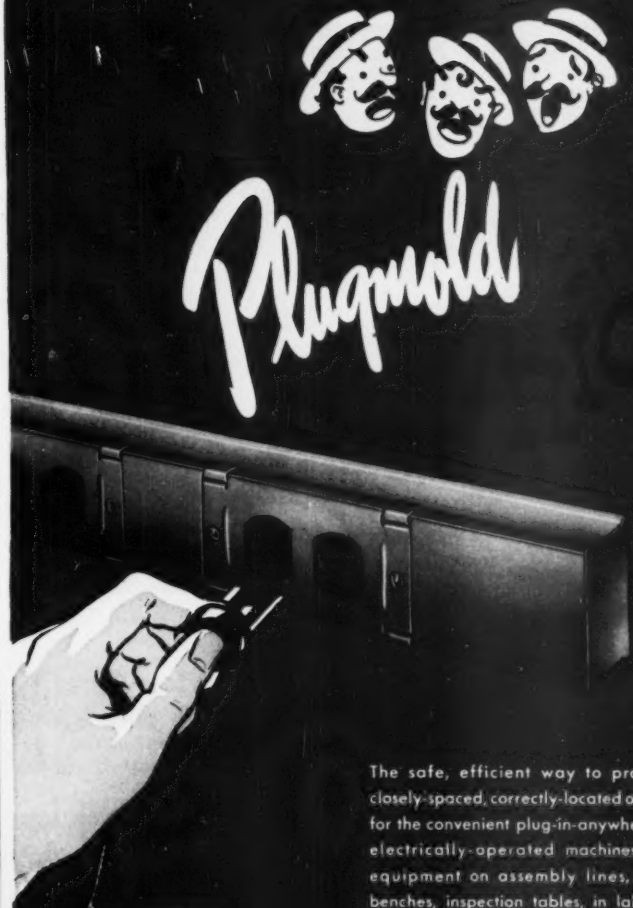
Both fixtures were made from materials on hand with about 4 man-hours labor, including erection. Each consists of: No. 20 gage sheet iron 10 in. wide by 37¾ in. long; one 1¼ x 2 x 12-in. mild-steel strap; one 100-w yellow lamp bulb; one weatherproof porcelain socket; one 6 in. by ½ in. conduit with bushing; 6 ft of 2-conductor outdoor lampcord; four ⅜-in. by 2½ in. lag screws; and four ¼ in. No. 20 brass screws. The procelain socket is located midway into the housing, 4½ in. from the strap side of the reflector.

Concrete Tower Footings Serve Dual Purpose

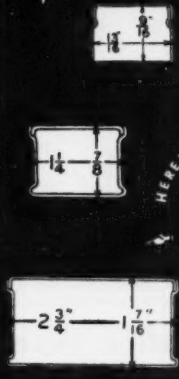
Concrete footings served a dual purpose for one tower in Toledo Edison's line to the Rossford Plant of Libbey-Owens-Ford. The tower was set in the glass company's waste sand dump along the Maumee River. This sand is as fine and smooth as quicksand, making a firm footing for towers difficult. It also has a chemical action on metal. Enclosing the tower legs in concrete protected them from chemical action and also provided the necessary bearing surface for a firm foundation necessary to support a tower.

No. 1

Plugmold



The safe, efficient way to provide closely-spaced, correctly-located outlets for the convenient plug-in-anywhere of electrically-operated machines and equipment on assembly lines, work benches, inspection tables, in laboratories, engineering departments, offices . . . wherever it is essential to have all the outlets you need when you need them, where you need them.



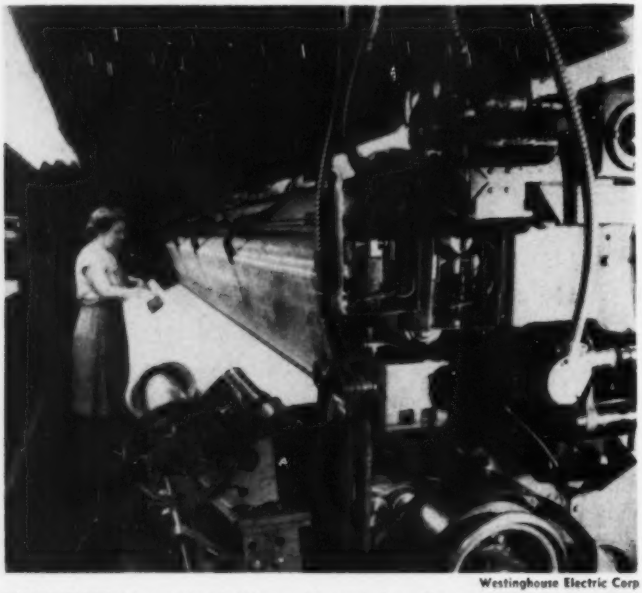
WHEN YOU PLAN OUTLETS... PLAN ENOUGH OUTLETS... PLAN TO PLUGMOLD IT!

Send today for this new bulletin describing in detail the PLUGMOLD trio.

THE WIREMOLD COMPANY
HARTFORD 10, CONN.

THE WIREMOLD COMPANY
HARTFORD 10, CONN., DEPT. D
Please send me a copy of the PLUGMOLD bulletin.
Name _____
Company _____
Address _____
City _____ State _____

INDUSTRIAL APPLICATIONS



Westinghouse Electric Corp

BEAM LET-OFF drive on tricot knitting machine controls small capacitor motor driving beam to run in response to sensitive tension-sensing bar over which threads pass

Electronic Drive Improves Nylon Quality

A new beam let-off drive is producing a much higher quality of knitted nylon cloth at Van Raalte Co, Inc, in N. Tonawanda, N. Y. Fabric shading has been virtually eliminated. This is the result of consistently maintaining proper runner lengths and supplying the warp to the knitting elements at a constant linear speed. This company has installed 120 of these electronic beam let-off drives in their plants.

These drives electronically control warp let-off so that the zero of mean position of the tension bar remains fixed. An increase in warp tension causes a change in position of the knitting machine tension bar. This change in position is converted to an electrical impulse which, amplified, operates a small a-c motor geared to the beam. Operation of this motor releases the beam, maintaining proper tension.

A high gear ratio is provided between the motor and the beam so that, when the beam is nearly empty and the knitting machine is operating at normal speed, the beam motor runs at approximately 1400 rpm, depending upon the runner lengths desired. A worm gear drive is used so that tension on the warp cannot exert a driving force on the motor.

The motor merely acts to release this tension. It drives the worm gear at such a speed that the unwinding of the warp because of the tension exerted on it by the threads is just enough to maintain proper warp tension. In other words, constant average deflection of the tension bar springs is maintained. Because the drive operates as a function of tension rather than speed, change in beam diameter is compensated for automatically.

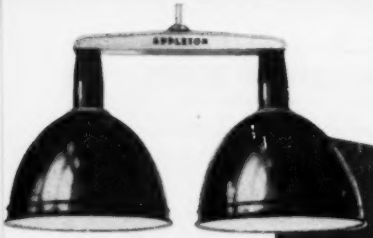
As tension momentarily changes through the action of the knitting machine, a dancer contact on the tension bar opens and closes. This contact, connected to the low-energy grid of a single thyratron tube, triggers the power circuit of the beam motor. The fluttering action of the tension contacts gives rapid on-off control of the motor voltage. Thus the motor operates at a speed to maintain proper tension.

When it is necessary to stop the knitting machine for any reason, a fast-acting dynamic braking system provides extremely rapid stopping which, in conjunction with fast acting dynamic braking on the main knitting machine motor, keeps cloth stop marks at a minimum. A pulse of direct current is forced through the motor windings, stopping the motor in one or two revolutions.

Continental Radiant Glass Heating Corp.

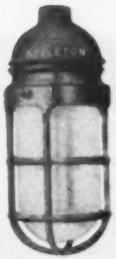
Panel Heating Saves Installation Time

Heating drafting room of the Aircraft Division of the Globe Corp, Joliet, Ill., with radiant glass panels saved space and installation time over other types of heaters considered. Working conditions are comfortable and operating expense is expected to be comparable with other heating systems, according to H. L. Linsky, Plant Engineer at Globe. Thirteen 1000-w heating panels were installed in the 20,000 cu ft room.



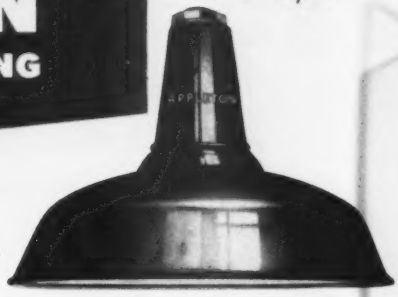
Twin Highlite—For high levels of illumination from a minimum number of outlets in high bay industrial interiors. Available with porcelain enamel or Alzac aluminum finish.

V-51 Convertible Vapertight Fixture—Exclusive Unit Assembly makes receptacle, globe, guard instantly detachable for relamping. Converts to higher or lower wattages just as easily.



SAVE

Money—Materials—Man-Hours with APPLETON INDUSTRIAL LIGHTING



Type EFU—First and still finest Explosion-Proof Lighting Fixture. Available for two 40 Watt, 48" lamps or two 100 Watt, 60" lamps.

Pat. No. 2,393,202

RLM Standard Dome Reflector—Made of Rust-resisting iron with three coats of baked porcelain enamel. Sectionalized construction permits easy installation, convenient servicing.

Stocklite—Provides perfect illumination for shelves and bins in stock rooms.

Fewer rejections . . . increased worker output . . . greater safety . . . less spoilage resulting from eye fatigue—these are only a few of many advantages that are yours with good plant lighting.

Appleton Industrial Lighting Equipment is precision-engineered to direct the *right intensities* of light to the *right places.* Combining expert Appleton design with rugged durability, these fixtures provide finely coordinated lighting systems at minimum initial cost and lowest possible service and operating expense.

Appleton excells in the manufacture of lighting equipment for hazardous locations and explosion-proof applications. For any industrial lighting requirement, contact Appleton, pace-setting manufacturer of electrical equipment for nearly half a century.

Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

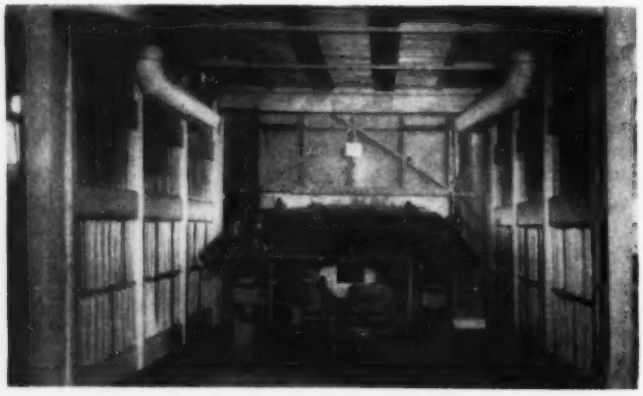
Field Engineers: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N.E. • BIRMINGHAM, 809 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 2013 Locust Street CINCINNATI, 608 American Bldg. • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9 BINGHAMTON • DALLAS • INDIANAPOLIS • KANSAS CITY • ORLANDO • MILWAUKEE NEW ORLEANS • SEATTLE • PORTLAND, ORE.

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

APPLETON ELECTRIC PRODUCTS

Balcony Saves Copper and Floor Space

Continuous spot welding with "four-head" electric welder produces 600,000 sq ft of metal "Q-flooring" monthly at H. H. Robertson Co, Ambridge, Pa. Three 22,000/440-v 500-kva transformers, located on balcony above welder, reduce 440-v circuit length—save copper, provide better voltage regulation, and save floor space. Capacitors on welder circuits further help maintain good voltage. E. M. Wenner, Industrial Power Engineer, Duquesne Light Co, Pittsburgh, Pa.



New Heating Tunnel Drys Gun Carriages

Drying gun carriages with rod-type resistance heaters in a new drying tunnel at C.A.M. Industries, Inc, Philadelphia, Pa., has kept defense production rolling at high speed. Sprayed finish on reconditioned gun carriages is dried in 15 to 20 min in tunnel having 132 2-kw U-shaped rod-type resistance units arranged in panels. Electric fans help keep all heating zones at correct temperature. L. Albertson, Application Engineer, Market Studies and Service Division, Philadelphia Electric Co.

INDUSTRIAL BRIEFS

Comfort Heating with electric radiant heater bolted to punch press located in open factory area at the Knox Stove Works, Knoxville, Tenn., provides direct warmth to lower part of workman's body. Semi-stationary type 800-w heater is easily attached by two bolts and can be moved to new machine as production needs change. Substitution of kwhr for man-hours otherwise lost in warm-up period saves more than equipment cost, helps build morale, and keeps production running smoothly. E. L. Wiegand Co.

Drying Steel Coating in automobile bumper production at Standard Steel Spring Co, Coraopolis, Pa., has been boosted 233% and quality improved since 126-kw infrared lamp tunnel was installed about 2 year ago. Entire operation is conveyorized. Sheets move on roller conveyor; coating is sprayed on and is dried in about 1 min in the infrared tunnel. Production has been increased from 600 to about 1400 sheets a shift. Formerly hot air drying was used which took considerable time and frequently was not satisfactory. E. M. Wenner, Industrial Representative, Duquesne Light Co, Pittsburgh, Pa.

Comfort Heating with infrared lamps for small printing plant housed in unheated garage at Mayer Printing Co, Washington, D. C., provides comfortable working conditions for printers even though room air temperature is less than 65F. By mounting 375-w lamps on adjustable porcelain sockets, they can be directed to the presses at night thus avoiding condensation damage. A. C. Crawford, Power Engineer, Potomac Electric Power Co, Washington, D. C.

Reheating Food for Christmas party with infrared lamps at Thompson Products, Inc, Harrisburgh, Pa., permitted 500 meals to be served piping hot from two serving lines in the cafeteria. One bank of 24 250-w infrared lamps, arranged on a 37 by 53 in. board suspended 4 in. above trays containing servings of turkey and filling, heated food to serving temperature in approximately 10 min. J. V. Ford, Industrial Representative, Pennsylvania Power & Light Co, Harrisburg, Pa.

25 years in the making...

Basic principles of interconnected operation, developed by the power industry, have led to L & N LOAD-FREQUENCY CONTROL

Interconnected operation of power systems has resulted in improved reliability, economical interchange of power, and greater operating flexibility. These advantages, which are so important in planning for future load growth, are possible because of two basic techniques which have evolved from years of operating experience:

1. the load dispatcher for each system is given immediate and complete information concerning load and generation conditions in that system.

2. each system absorbs as much of its own customer load changes as possible.

Leeds & Northrup system control achieves these two operating techniques because L&N progress has been "in phase" with changing utility operating requirements during the past 25 years. Speedomax Telemeters bring an almost instantaneous appraisal of system load facts to the load dispatcher's attention; L&N Load-Frequency Control automatically regulates the system's generating plants to maintain desired schedules of net power flow into or out of the system.

And L&N equipment is backed by field engineers who have extensive experience in power plant applications. Whether yours is a small utility, or a large one—interconnected or isolated—L&N equipment and engineering are ready to help you prepare for future load growth.

For details, write to 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl Ad ND4-56-461(8)

General Electric Co

LIGHTING SALES MANAGER Lee Holtman, right, discusses with Glen Marshall, sales representative, the exactness with which the recipe for ideal dining alcove lighting was followed

Light-Conditioned Home Proves Popular

Indiana's first light-conditioned home, in Franklin, Ind, sponsored by Public Service Co of Indiana, was welcomed by newspapers with the greeting, "There IS something new under the sun!" Promoted by lighting sales manager Lee Holtman, through cooperation with Grose and Christie, the builders, the home incorporates the "right lighting" recipes. These were developed by company lighting specialists, and leading authorities on home lighting from Nela Park. Grose and Christie were so pleased with the results they have indicated that they intend to light-condition the remaining 30 homes in this residential development.

Visitors thronged the new home for "Open House." They were greeted at the door by company guides who pointed out the home's all electric features.

Comment cards were filled out and turned in by visitors as they left the home. Of those filling out the cards 168 requested assistance with their own lighting problems. Of the 665 answering the questionaire, 42% liked the living room lighting best and 56.1% listed valance lighting in the living room as the lighting idea they would want most for their home. In the kitchen, 54% wanted lighting over the range in the kitchen and 52% wanted mirror lights in the bathroom of their own homes.

Other lighting ideas visitors wanted included: bed light 30.2%; sink light in kitchen 29.3%; ceiling light in bathroom 14.7% and floor lamps in living room 13.8%.

Plans are being made to present the recipes for "better living in a better lighted home" to 25 other communities that are located in the company's territory.

Employee Range Sales Reflected in Dealer Sales

W. GRANT PARRY, General Sales Manager, New Jersey Power & Light Co, Dover, N. J.

Effect of electric range sales to utility employees is reflected in dealer appliance sales in the territory served by New Jersey Power & Light Co. This was shown by an offering to employees to aid in bringing out the advantages of electric cooking, counteract competition with bottled gas, and improve dealer activity. At the same time electric range saturation among the employees was increased to at least 43%.

The company was a combination utility until 1947 at which time the gas properties were sold. In 1948 a survey revealed that 17% of the customers were cooking with electric ranges. In 1950 another survey showed that 25% of the customers were using ranges, an increase of 8% during a two-year period.

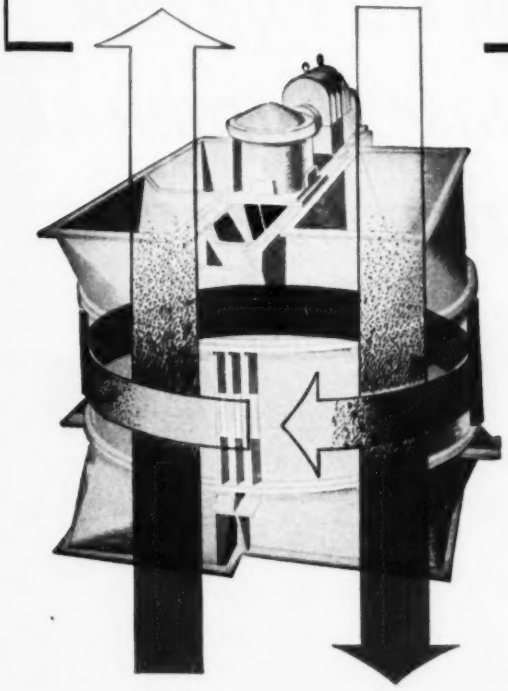
By the latter range survey, 41% of the residential customers were using bottled gas. To discourage the use of gas in the territory and to inform the customers of the economics of electric cooking as compared to bottled gas, a mailing piece was sent to all bottled-gas users during the spring of 1951. The folder was well received. Reports came in that customers would have purchased electric

(*Continued on page* 174)

more than 285,000,000 lb/hr of post-war steam generating capacity

equipped with *Ljungstrom*

AIR PREHEATERS



Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 285,000,000 pounds of steam per hour.

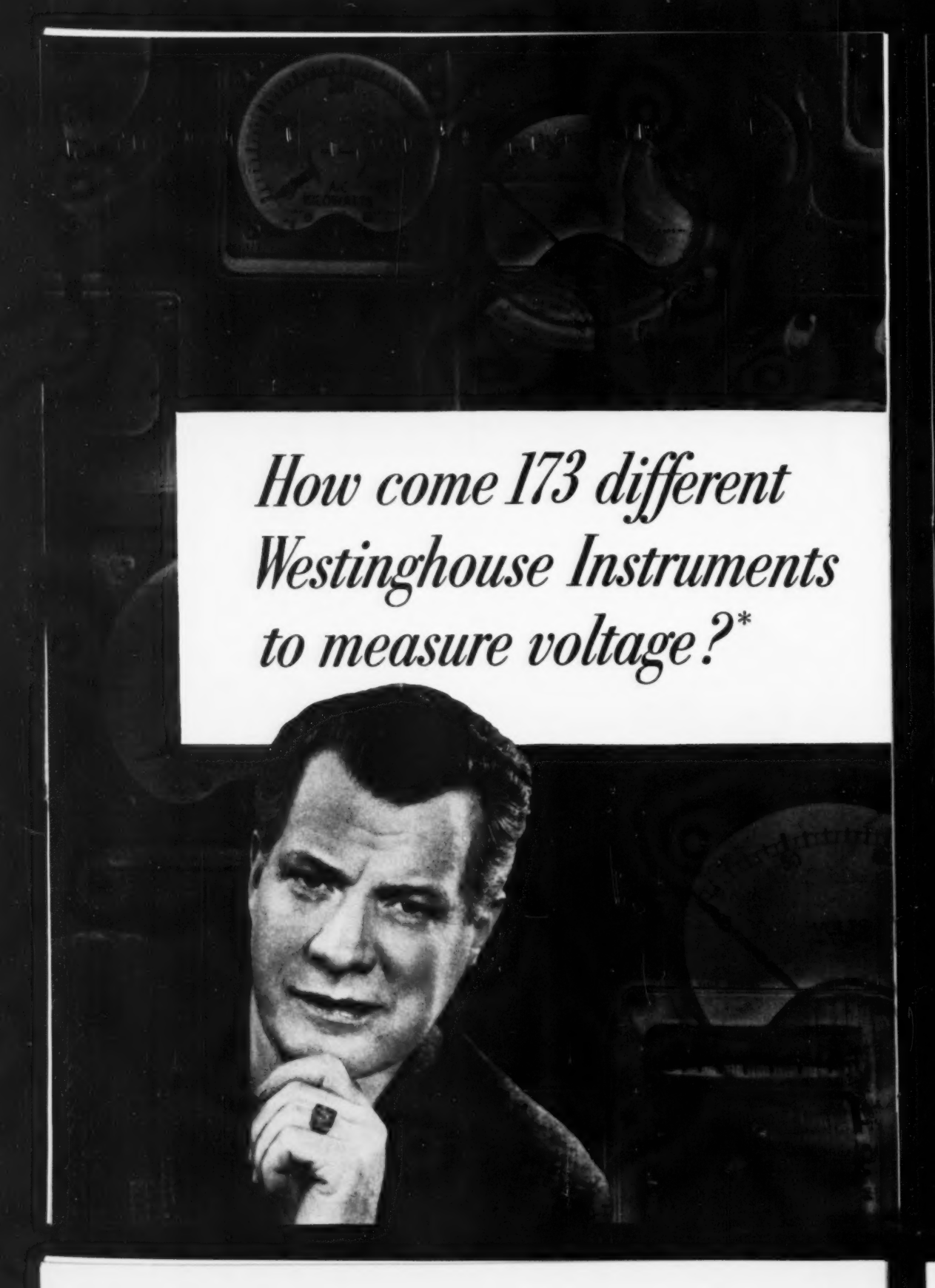
The reasons for the steadily increasing preference for the Ljungstrom air preheater are simple enough. The continuous regenerative counterflow principle assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. Its proven reliability and low maintenance eliminate costly shutdowns.

If you are planning to build a new plant or modernize an old one, investigate the possibilities of the Ljungstrom. The specialized experience of Air Preheater engineers is at your disposal, to aid in effecting the most economic heat recovery from flue gases.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION

60 EAST 42d STREET • NEW YORK 17, NEW YORK



*How come 173 different Westinghouse Instruments to measure voltage?**

Because

—a wider choice of instruments offers you . . . greater latitude in product design . . . the answer to more precise control of a process . . . an opportunity to boost the efficiency of plant facilities.

the proper instrument

Whether you want to measure amperes, volts, watts, vars, frequency, power factor or synchronism—you can always get the *right* instrument when you specify Westinghouse. It's the most complete line of electrical measuring instruments in the industry! The line also includes many types to measure position, time, temperature and speed.

properly engineered

For any instrument application, you want sustained accuracy . . . easy readability. Westinghouse designs are the result of over 60 years of instrument engineering aimed at giving you the ultimate in these essentials of fine instrumentation. The performance of all Westinghouse Instruments meets ASA Standards.

properly applied

You save engineering time and expense . . . gain more effective use of instruments when you have manufacturer's assistance in their application. A team of highly trained Instrument Application Engineers is available to work with you in applying all Westinghouse Instruments.

registers an advantage for you!

The experience of a large eastern manufacturer provides an example. By applying standard Westinghouse GY-40 Recording Wattmeters to predetermine load on mixers, they obtained a 15 percent saving in mixing cycle time! A typical pay-off when the proper instrument, properly engineered is properly applied! Next time, specify Westinghouse!

J-40418

*

The extensive coverage of Westinghouse voltage measuring instruments is further emphasized by the fact that there are 36 different instruments just to measure d-c millivolts.

For complete information about all Westinghouse Instruments, wire for Booklet B-4696. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE... IF IT'S

Westinghouse

WESTINGHOUSE

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

Employee Range Sales

(Continued from page 170)

ranges if they had been aware of the information in the pamphlet. Also new home owners stated that bottled gas salesmen called but they had never been approached by dealers selling electric ranges. That situation has been overcome by the company's dealer representatives calling on all new home owners prior to the date the home is completed. A decided increase in the percentage of new homes going all electric has been noted.

Further to promote the advantages of domestic electric cooking, a special offer was made to the utility's employees. Sale of 61 electric ranges resulted from a 17-day campaign, November 13 to 30, 1951. Purchases were made by approximately 10% of the company's employees. The effect of this was to raise the saturation of ranges in employees' homes from 33 to 43%.

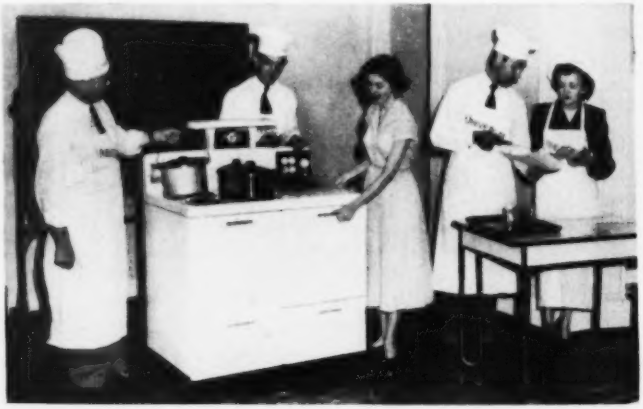
The offer included a wiring allowance up to $45 and special prices on the ranges. The price was not subsidized because the company was able to negotiate an attractive deal through the distributor and manufacturer. The utility's only contribution was the wiring allowance.

This employee campaign had a stimulating effect on range sales by dealers, as is indicated in the accompanying sales record for 5 months. The real effect is in November, the first month of the period when the dealers sales exceeded the corresponding month of the previous year, 45 ranges more than the sales to employees.

Ranges Installed in NJP&L Territory

Year	Aug	Sept	Oct	Nov	Dec
1950	358	276	302	206	255
1951	206	202	262	312	367

A further effect is shown in the following data: The company serves 61,624 year-round residential customers with an average annual consumption of 2,475 kwhr, and 12,203 seasonal customers with an average of 678 kwhr. This gives an average of 2,248 kwhr for all residential customers, which is an increase of 210 kwhr over the corresponding 12-month period.



ELECTRIC COOKING on the Universal range is demonstrated by Betty Woods (center) home service director of the range distributor, to Louis Oliveros, R. A. Long, J. L. Roberts, and Carolyn Gardner, Georgia Power Co

"Chef Schools" Train Sales Personnel

To familiarize salespeople and others interested with the merits of the Universal electric range, a series of "chef schools" was recently put on in the district offices of the Georgia Power Co. The series was a co-operative undertaking between the Electric Sales and Service Co, distributor of the range, and the merchandising division of the utility. Betty Woods, home service director of Electric Sales and Service, conducted the schools, supervising the preparation of a complete meal, with each person attending taking an active part in the cooking—and in the eating, later.

M. W. KELLOGG

American Gas & Electric Service Corp.
Boston Edison Co.
Central Hudson Gas & Electric Co.
Chaudronneries A. F. Smulders (Belgium)
Compania Argentina De Electricidad (Argentina)
Compania De Fuerza Del Suroeste De Mexico S.A. (Mexico)
Consolidated Edison Co. of N. Y.
Detroit Edison Co.
Dow Chemical Co.
Elektricitetsselskabet Isefjordvaerket (Denmark)
Ford Motor Co. of Canada Ltd. (Canada)
General Electric Co.
Hartford Electric Light Co.
Houilleres Du Bassin De Lorraine (France)
Houilleres Du Bassin Du Nord Et Du Pas-De-Calais (France)
Hydro-Electric Power Commission of Ontario (Canada)
Indiana & Michigan Electric Co.
Interbrabant (Belgium)
Long Island Lighting Co.
Metropolitan Edison Co.
Mexican Light & Power Co. (Mexico)
Monongahela Power Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Palestine Electric Corp., Ltd. (Israel)
Philadelphia Electric Co.
Public Service Co. of Northern Illinois
Public Service Electric & Gas Co. of N. J.
Societe Anonyme John Cockerill (Belgium)
Societa Edison (Italy)
Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)
Societa Meridionale Di Elettricita (Italy)
Sociedad De Electricidad De Rosario (Argentina)
Union D'Electricite (France)
United Illuminating Co.
Westinghouse Electric Corp.
West Penn Power Co.
Wisconsin Public Service Corp.

M KELLOGG W

6000 Pictures Looking for "Eyebrows" in critical power piping . . . *because—*

Through the photomicroscope, metallurgists carry on a never-ending search for evidence of graphitization, the phenomenon which prior to 1943 was considered of only academic interest.

They are hunting particularly for what they call the "eyebrow" or chain type of graphite. It is these malformations that cause planes of weakness in carbon steel and carbon moly hi-temp-hi-pressure power piping . . . weaknesses that can result in serious failures.

Since graphitization occurs only after piping has been in high temperature service for sometime, means of precluding its formation can usually be determined only from studies of specimens in which the phenomenon has occurred.

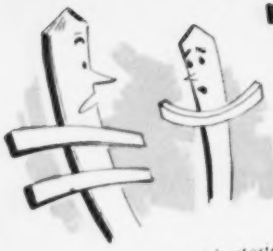
Although the "whys" are unknown, metallurgists have already come up with methods of inhibiting the formation of graphite in carbon steel or carbon moly piping. Annealing welds at about 1300 F appears to help. Addition of chromium to carbon moly analysis piping seems to preclude graphite formation entirely; at least no graphitization has yet been detected in this type of piping which Kellogg recommended for such severe service nearly a decade ago.

Still Kellogg metallurgists continue to research the problem, endeavoring to pinpoint the causes of graphitization and to improve fabricating techniques and materials. More than 6,000 test pieces —cut out of actual service piping —have been polished, etched, photographed and evaluated in the last nine years. Such fundamental knowledge is a valuable *plus* obtained by any utility company when it specifies "Main steam and reheat piping by Kellogg".

OTHER FABRICATED PRODUCTS including:
Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchangers . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings . . . Radial Brick Chimneys

for 51 years an integral part of industrial progress!

The M. W. Kellogg Company (A Subsidiary of Pullman Incorporated)
New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.



"The termites got your Uncle Knott..."

(Cissie Cleanpole's stories of the grim days B.P.)*

"Yes, dear, he really was a fine tree in his day . . . and a fine pole, too, before he got bugs in his sapwood. But your Uncle Knott fell in with bad companions . . . termites.

"He used to insist that he could take them or leave them. But the time came when he couldn't. Then one night he simply keeled over in a high wind, and that was the end of poor Knotty. But you musn't think too harshly of him. That was before the days of PENTA Preservative . . . "

*B.P.—*Before PENTA*

PENTA gives clean, positive, protection

Poor Uncle Knott could have been saved by early use of PENTA Preservative, the clean chemical formula that's so easy on the men who climb the poles.

For the powerful, laboratory-controlled properties of PENTAchlorophenol are as effective as they are uniform. This modern preservative penetrates deeply, won't leach out, assures long years of life and minimum maintenance costs.

PENTA-treated poles are guarded scientifically from shell rot, top rot, ground line decay and insect damage. Yet PENTA'S clean protection for your poles costs no more than other types of wood preservation.

CHAPMAN CHEMICAL COMPANY
333 N. Michigan Ave., Chicago 1, Ill.
DERMON BUILDING, MEMPHIS 3, TENN.

CHAPMAN

Penta Preservative

Conforming to A.W.P.A. Specifications P8-49 and P9-49

Americanism Has Meaning For Contest Winner

Evelyn Finucane, high school senior, admires the Raytheon console 17-in. television, radio, and three-speed record player combination, and gold trophy, first place awards presented to her in the recent Chicago finals of the nationwide Voice of Democracy contest. Evelyn's prize winning talk on Americanism, recorded during the contest and broadcast the following day, qualified her for the national finals. The contest was conducted in Chicago under the auspices of the Junior Chamber of Commerce in conjunction with radio station WLS.

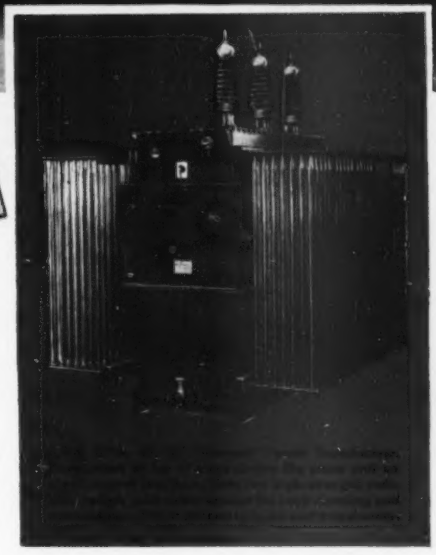
Range and Laundry Installation Manuals

Detailed specifications for wiring and connections of electric ranges and home laundry equipment have been compiled by the Wiring and Specifications Committee, Commercial Division, Edison Electric Institute. They are available from the Institute in two manuals, the range 50¢ and the laundry 35¢, per copy.

The range manual covers general wiring methods, wiring in new construction, and revision of inadequate services. Schematic drawings of, and materials needed for, typical installations, and an appendix giving examples of calculation of circuit capacities, conclude the manual.

The laundry booklet discusses layout of equipment, planned wiring for it, and calculation of capacity required. Special attention is given to automatic washers and clothes dryers.

Uptegraff POWER TRANSFORMERS



Individually DESIGNED, BUILT, TESTED

Every Uptegraff Power Transformer is made to exacting standards for quality performance and is thoroughly tested as an individual unit before shipment.

Sensible design and careful construction are combined to insure long life and dependability. Consider these features:

1. Core and coils thoroughly dried and oil impregnated while warm.
2. Super-sensitive electronic leak detection eliminates the smallest leaks in tanks and bushings.
3. All external tank surfaces shot blasted and covered with three coats of enduring paint; bottom of tank is under-coated.

These are just a few of the many details that make dependability.

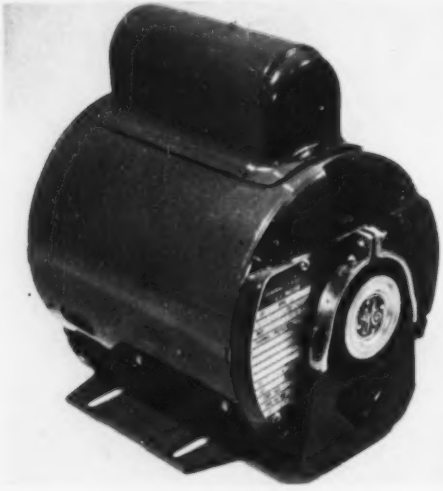
We can quickly meet your needs with transformers built to your specifications.

R. E. UPTEGRAFF MANUFACTURING CO.

SCOTTDALE, PENNSYLVANIA

Makers of: POWER • DISTRIBUTION • INSTRUMENT SPECIALTY TRANSFORMERS

NEW EQUIPMENT



Smaller, Lighter FHP Motors

A new line of fractional horsepower motors that reportedly embodies an entirely new concept of motor design and manufacture has been announced by the GE Fractional Horsepower Motor Department.

Designated as "Form G," the motors, according to GE engineers, weigh as much as 51% less per horsepower than the models it replaces, and is considerably smaller in size. Also, its versatility of application has been broadened and its appearance modernized.

The motors are available in open, drip-proof and totally enclosed fan-cooled models in polyphase, capacitor start, split phase and permanent split capacitor types.

The motors are engineered for dissipation of heat losses. With improved bearings, lubrication, and insulation, the Form G general purpose sleeve bearing motor offers a wider range of application and will eliminate the extra expense of special enclosures or ball bearings.

Motors are available in a complete range of standard horsepowers, speeds, voltages and frequencies.

General Electric Co, Schenectady, N. Y.

Utility Truck Body

The new body is known as the General Service 75 (GS-75) and reportedly is the result of two years of planning and engineering.

The GS-75 body will mount on any ½-ton truck chassis with a "CA" dimension of 39 to 41 in., without fenders and with a short running board. The body weighs 535 lb

The top sideboxes on either side can be equipped with the Type A arrangement consisting of convenient shelves. Optional Type B arrangement consists of two rows of trays, one above the other, extending the full length of the body.

Highway Trailer Co, Edgerton, Wisc.

Mica Paper

A new grade of Micanite, made with mica paper instead of mica has been developed by the Mica Insulator Co, Schenectady, N. Y. The use of mica paper in various types of manufactured electrical mica insulation such as segment plate, hot molding plate, and mica tapes results in finished products which exhibit electrical properties superior to similar items manufactured with mica splittings.

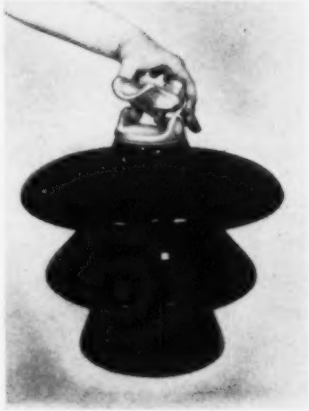
Four different weight mica papers are presently available for the production of mica paper Micanite items.

Mica Insulator Co, Schenectady, N. Y.

Insulator Clamp Assembly

This large-size clamp assembly will accommodate all aluminum, ACSR conductors or conductors and armor rods up to 1½-in. in diameter. It is interchangeable on O-B Clamptop, pintype and post insulators and ground wire brackets.

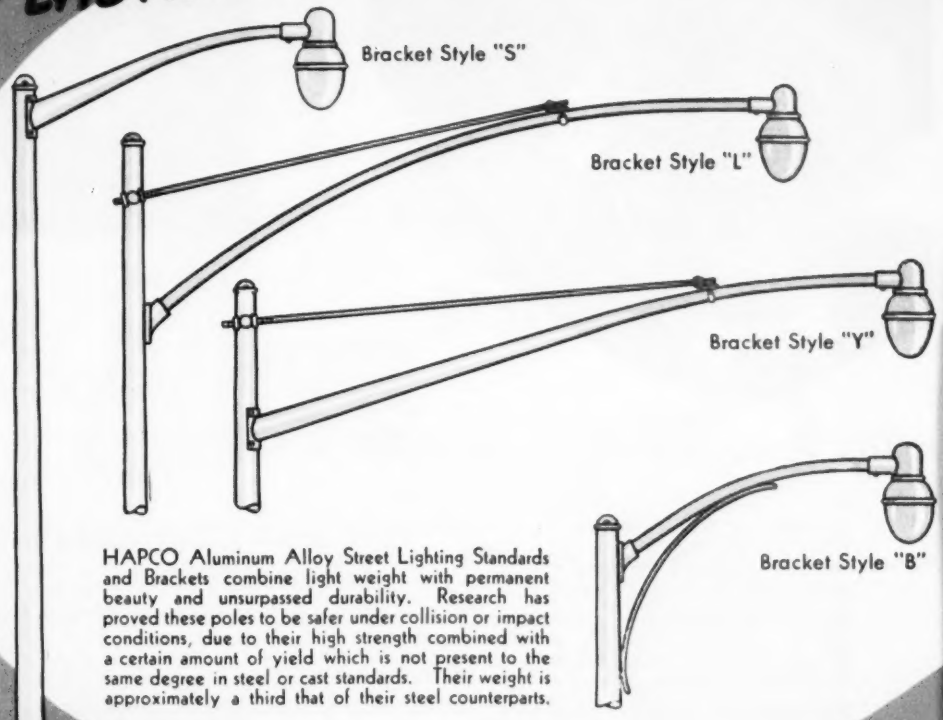
The high strength aluminum alloy body will operate at up to 1,000 amp, 60 cycles, with virtually no heating. Special bolt heads hold the clamp securely to the mounting pintles and are designed against uplift.



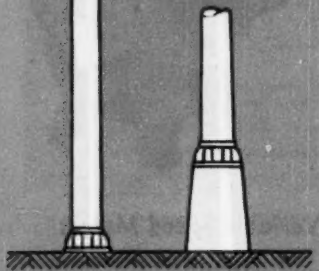
Ohio Brass Co, 380 No. Main St, Mansfield, Ohio

HAPCO Aluminum Alloy Street Lighting Standards

for LASTING BEAUTY



HAPCO Aluminum Alloy Street Lighting Standards and Brackets combine light weight with permanent beauty and unsurpassed durability. Research has proved these poles to be safer under collision or impact conditions, due to their high strength combined with a certain amount of yield which is not present to the same degree in steel or cast standards. Their weight is approximately a third that of their steel counterparts.



POLE TYPE No. 1 Standard Base — POLE TYPE No. 1-T Transformer Base

- Pole heights from 20 to 35-feet.
- Pole diameters, 8-inches or under, tapering to 4-inches.
- All poles are seamless and jointless.
- Tapering is produced from a single tube by a special process.
- Hand holes furnished extra on request on Type No. 1 Poles.
- Brackets are seamless, jointless and may be either tapered or uniform in diameter.
- Bracket lengths from 3-feet.
- Special bracket styles to your specifications.

[Write for detailed information on your individual problems, and a copy of the bulletin, "Hapco Aluminum Alloy Street Lighting Standards."]

HUBBARD ALUMINUM PRODUCTS COMPANY

MANUFACTURER OF HAPCO QUALITY ALUMINUM PRODUCTS

A Division of HUBBARD and COMPANY

6301 Butler Street • Pittsburgh 1, Pa.

Top Brass Says I'M GUILTY

In a way that's correct. He was mighty careful about the kind of equipment he bought—*not* so careful about the kind of fire protection he gave it. When fire hit it was too late.

There's a moral to this: Your transformers, generators, switching equipment and other critical components can't be spared today. Give them the fire protection they deserve.

Here CARDOX experience can help you.

The *first* "CARDOX Low Pressure Carbon Dioxide System"* ever built went into a central station. Since then 14 of the nation's 25 largest utility companies have chosen CARDOX Systems to safeguard operations.

The performance record has been extraordinary! CARDOX CO_2, applied as easily in *tons* as in pounds, overwhelms big or little fires quickly and positively . . . reduces fire damage to a minimum . . . causes no extinguishment damage whatever.

CARDOX protection can help you conserve the equipment you'd be hard-pressed to replace. Let's get together. Write us, please.

*Covered by Patents Issued & Pending

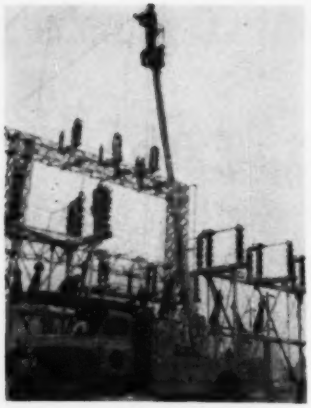
CARDOX

ORIGINATOR OF Low Pressure CO_2

FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

Offices in Principal Cities



Hydraulic Lift

The industrial monkey consists of a hydraulically operated telescopic boom for high work. Boom has a self-leveling cage that takes a workman directly to the spot where he must work.

In operation, the telescoping boom has a 270-deg turning radius. The workman's cage is mounted on heavy-duty insulators and has a platform insulated against 24,000 v.

Public utilities will find them useful in tree-trimming work, pole and line work and street lighting work.

The Donwill Co, 835 S. E. Main St, Portland, Ore.

Variable Speed Motors

The type KFEA variable speed motor with single reduction gears is now available in ratings of 20 and 25 hp. Units are made in speeds of 728 rpm with infinite speed adjustments within the 2:1, 3:1 or 4:1 ranges.

Features are accurate maintenance of speeds under varying loads, belt tension in proportion to load, herring-

count these *extras* in...

WEAVER

hot line clamps

1-WS
Electro-Bronze for Copper to copper.
Also available Cadmium Plated for General Purpose Use

WSB-C
Cadmium Plated for General Purpose Use.
Also available in Electro-Bronze for Copper to Copper or Heat Treated Aluminum for Aluminum to Aluminum or Aluminum to Copper

12 Outstanding Advantages . . . Competitive Prices

- Cost of high strength electro-bronze or aluminum alloy in our own modern foundry.
- Two clamps accommodate all main line wire sizes from 8A Copperweld to 1/0 Aluminum Over Armor Rods and all tap wire sizes from 8A Copperweld to 2/0 Copper or 1/0 ACSR.
- Ampere rating exceeds rating of maximum wire size.
- Clamps will withstand tightening torques far in excess of normal operating requirements.
- Sufficient clearance provided on all sizes to make application on maximum wire sizes easy and efficient.
- Main line saddle attached securely to tightening pin eliminates breaking or loosening.
- Free running threads efficiently convert tightening torque to pressure on conductor.
- Weaver exclusive lubricated bronze insert on aluminum clamps prevents seizure between pin and body.
- Aluminum alloy clamps are heat treated for maximum strength.
- Round or V-Shaped wire bearing surface available.
- Main pins furnished with National Course or National Fine threads at no difference in cost.
- All types and sizes will fit standard hot sticks.

WEAVER PRODUCTS ARE PRODUCED COMPLETELY IN OUR OWN MODERN INTEGRATED FOUNDRY AND FACTORY FACILITIES. VISIT US WHEN YOU ARE IN ST. LOUIS.

J. A. WEAVER Company

2110 HOWARD ST. • ST. LOUIS 6, MO.

TELEPHONE CEntral 0881

"Plan Painting" with Subox
Protects Metal, Eliminates Costly Repainting

During erection of new power stations or other industrial plants, construction dirt and dust make it virtually impossible to achieve the final decorative painting without several paint and repaint jobs.

This costly duplication can be avoided with Subox and Subalox paints and "Plan Painting" — the science of the right paints at the right time. Subox paints and this plan insure utmost protection yet reduce painting and repainting to the thriftiest minimum.

And where special metals become scarce and unavailable, Subox and Subalox paints increase the life of standard metals when applied according to plan during construction.

Subox paints can be used as primers, finishing coats or both. They can be applied over new, rusty or old surfaces, including galvanizing. They are superior protective paints because their basic pigment is suboxide of lead, and they are formulated by experts.

Available in a wide range for industry including every phase of the electrical industry.

TIME-TESTED FOR OVER 25 YEARS

The widespread acceptance of SUBOX and SUBALOX over a quarter century is evidence of superior performance in exacting usage. Subox specialists in protective painting have devoted a lifetime to perfection of the product.

Write today for your free copy of informative article on how to cut painting costs with "Plan Painting."

Subox Inc.

1 FAIRMOUNT PLANT HACKENSACK N. J.

bone rotor, direct through-ventilation, and drip-proof construction.

Sterling Electric Motors, Inc, 5401 Anaheim-Telegraph Rd, Los Angeles 22, Calif.

Lighting Fixture

The AA-51 series explosion-proof lighting fixture offers greater safety, easier maintenance, greater lighting efficiency and faster servicing.

Featured is full circle venting, use of the entire lower edge of the hood as a continuous louvre. Units are available in sizes from 60 to 500 w for Class 1, Group C & D hazardous locations.

Appleton Electric Co, 1701-59 Wellington Ave, Chicago 13, Ill.

Fluorescent Fixtures

It is claimed the new ALS industrial unit represents a distinct departure from the old type of luminaire. The usual 13-deg shielding angle across the unit has been increased to 30 deg.

The reflecting surfaces are designed to appear much lower in brightness

(*Continued on page* 186)

T&B METHOD
Fittings and Tools for ALUMINUM and Copper Conductors

FOR ACSR & ALL ALUMINUM CABLES

Tension Splicers

Dead Ends

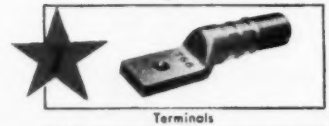
Jumper Splicers

Repair Sleeves

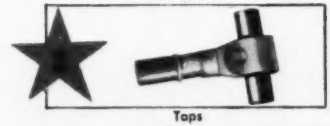
Light Portable Tools (for tower work)

FOR UNDERGROUND & INDOOR INSTALLATION

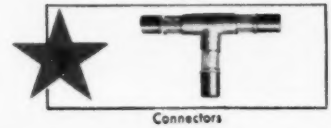
Splicers



Terminals



Taps



Connectors

Tight, sound connections every time with T&B Method Aluminum Terminals for aluminum cable

Serrations inside the terminal barrel scrape the oxide off the aluminum cable. Tremendous pressure exerted by lightweight T & B tools rubs the metal clean—compresses the stranded cable to the equivalent area of solid rod—squeezes the air out of the cable—and permanently seals it against corrosion! L-o-n-g contact of barrel to cable counteracts tendency to cold-flow. *No joint compound needed.*

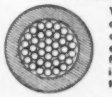
YOU GET THEM EVERY TIME BECAUSE . . .

The high-conductivity, ductile aluminum barrel flows readily under compression—and the dies exert just the *right* amount of compression. Die code number stamped on every barrel assures use of correct die—and marking shows exactly where to place the die on the barrel. Once the dies have closed, the job is *sure* to be right.

ENGINEERED RIGHT . . . DISTRIBUTED RIGHT

T & B Method fittings and tools, like all T & B quality fittings, are designed for lowest installed costs. They're furnished exclusively through local T & B distributors under the T & B Plan.

FROM CIRCLE TO HEX IN SECONDS



You start with a circular cable (a typical one consists of about 75% metal, 25% air). You compress it, by the T & B Method, to the equivalent area of a solid rod—as the dies force the fitting from circular to the characteristic T & B Method hexagonal shape—all in the space of just a few seconds!

FOR THE FULL STORY ON THE T & B METHOD, WRITE FOR BULLETIN # 67

THE THOMAS & BETTS CO.

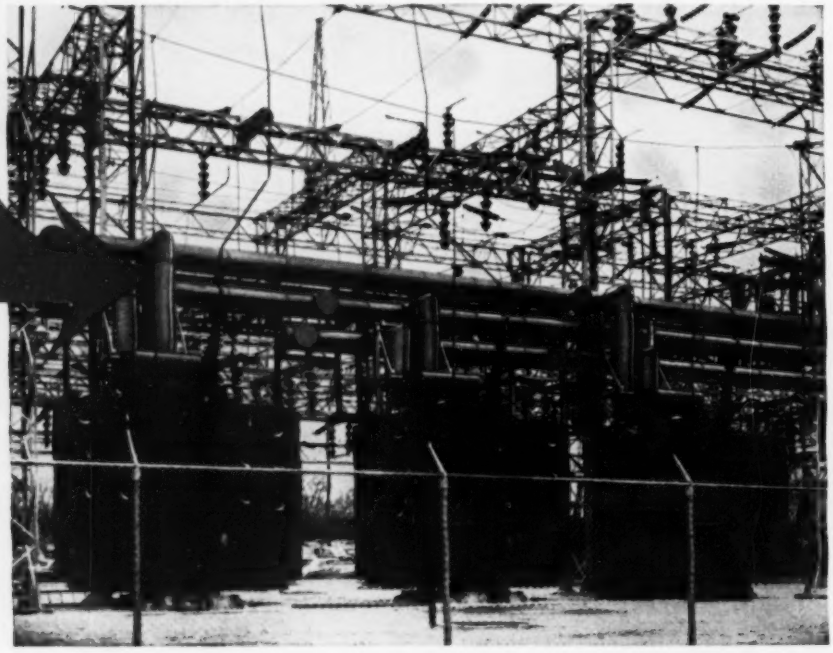
INCORPORATED

35 Butler Street
Elizabeth 1, New Jersey
Thomas & Betts, Ltd., Montreal, P. Q., Canada

THERE'S A T&B ENGINEERED PRODUCT for every wiring job in the complete T & B line of fittings for all conductors and raceways

Manufacturers of Electrical Fittings since 1898

FIRST STEP
TOWARD SERVICE CONTINUITY...

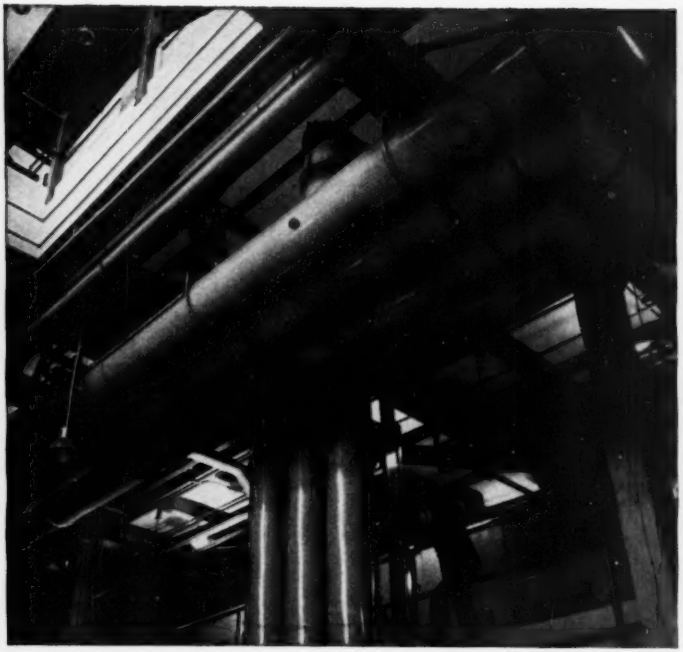


Generator leads—

These key links in power generation and distribution systems must have high dielectric and mechanical strength. I-T-E Isolated Phase Bus is designed and built to meet all the electrical and mechanical essentials.

that satisfy your requirements

I-T-E Isolated Phase Bus can be used indoors or outdoors—on long runs or short runs. It can be threaded through complicated mazes of piping and conduit. Connections to transformers and other auxiliary equipment are neat and easy.



easy-to-order

Working from a simple, single line diagram of your circuit and building, I-T-E supplies finished drawings and a quotation for a complete bus.

And the bus production capacity of I-T-E and its R&IE Equipment Division is sufficient to satisfy the requirements of all the generators now being produced in the United States.

easy-to-install

Readily adaptable to any building contour, I-T-E Isolated Phase Bus may be furnished in sections of three phase units, when required. It may also be delivered as packaged parts—to meet particular installation problems.

proved in service

I-T-E Isolated Phase Bus has been transmitting the power from the largest generators since 1936. Over 24 conductor-miles in 213 installations are in service today.

For further information, write for Catalog Section 10004. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania.

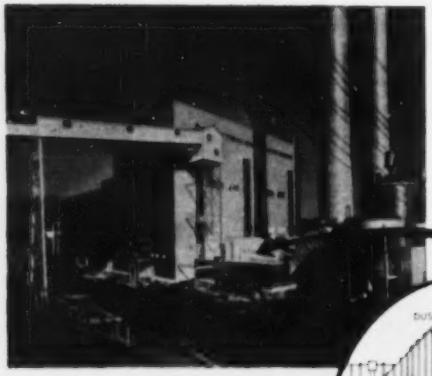
I-T-E

ISOLATED PHASE BUS

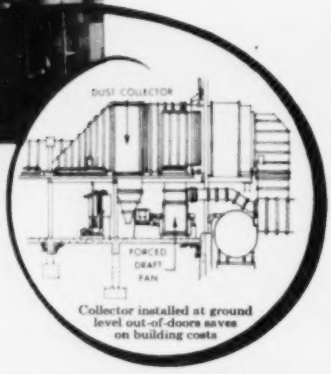
Power Switching Equipment:
R&IE Equipment Division, Greensburg, Pa.

Canadian Mfg. and Sales:
Eastern Power Devices, Ltd., Toronto

Export Sales:
Philips Export Corp., N. Y., N. Y.



Titus Station
Metropolitan Edison Co,
Reading, Pa.



Collector installed at ground level out-of-doors saves on building costs

Answer *your* specific dust control problems with an

AEROTEC

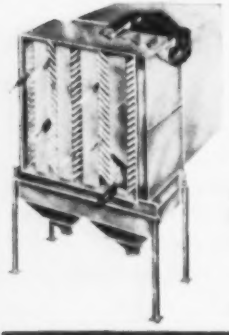
DUST COLLECTOR
exactly tailored to your needs

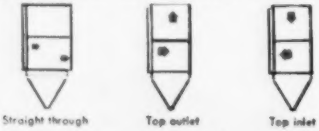
Here is one of the many instances in which the Aerotec Design 3 RAS Dust Collector proved its high efficiency so conclusively that Metropolitan Edison purchased a third unit. Gilbert Associates Inc., of Reading, Pa., were designers and constructors. Three bituminous coal-fired steam generators at this modern power plant, will be equipped with Aerotec Collectors. Layout and breeching are so designed that an Aerotec electrical secondary can be added at a future date without loss of the initial investment.

This mechanical collector, with its multiple, small-diameter tubes, offers you the advantages of high dust recovery in the ultra-fine ranges, even at partial load. The tubes are permanent mold aluminum castings of absolute uniformity. This construction provides the smooth inner wall necessary to ultra-fine dust collection. Tubes are assembled at the factory in lightweight "building block" sections. These assemblies permit flexible arrangement to suit your needs, with the economy of standard construction.

Let our engineers bring to your problems the benefits of their long experience in the field of flyash collection. No obligation.

Typical Inlet and Outlet Variations





Catalog 601 gives you complete details on standard and special Aerotec arrangements, plus other useful data on dust collection. Call or write for your copy today.

Project Engineers

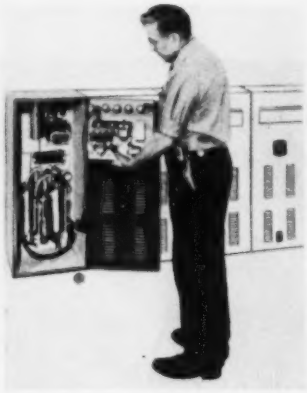
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, LTD.
Montreal 25, Quebec — Toronto 3, Ontario

THE AEROTEC CORPORATION
GREENWICH, CONN.

beyond the shielding angle than has been obtained in previous units. About 25% of the light is directed upward to light the ceiling and eliminate the dark cavity above fixtures.

Smithcraft Lgt Div, Chelsea 50, Mass.

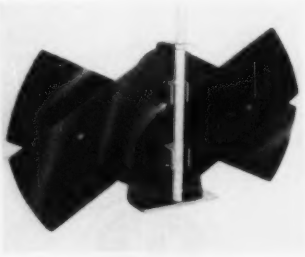


Electronic Welder Control

The electronic, non-synchronous resistance welder control now provides easier installation, less maintenance, smaller size and easier mounting.

The NEMA 3B weld and sequence timing circuit requires only 4 tubes plus valve relay and firing relay. All tube circuits fail safe. Controller is 15-in. by 15-in. by 37-in.

Square D Co, 4041 N. Richards St, Milwaukee 12, Wisc.



Pole Key Anchor

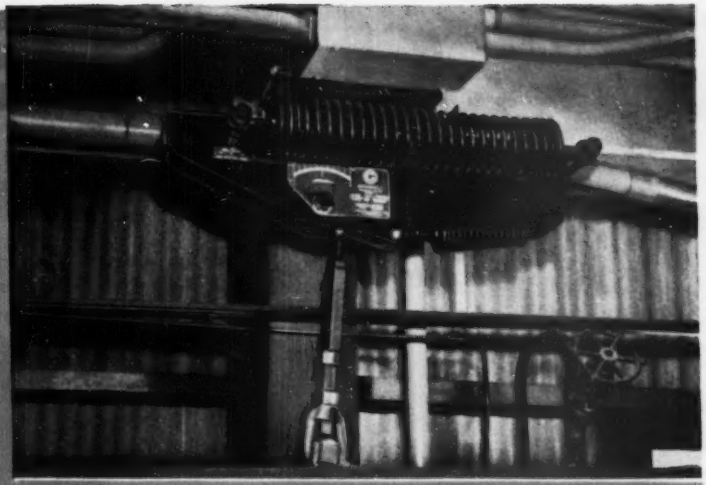
This new design for pole key anchors has been announced recently. Used for keying poles at the base to prevent leaning as the result of one-sided strain where guys are impractical, it can also be used just below ground level on the strain side to take the place of logs used as pole keys.

The pole key is often used on street

(*Continued on page* 190)

PIPING THAT MOVES

... calls for supports that are flexible



Grinnell Model L Constant-Support on 12-inch main steam at Somerset Power Station, Montaup Electric Co., Somerset, Mass. Pressure, 1300 psi; temperature, 930°F; load, approximately 4000 pounds. Note minimum headroom available.

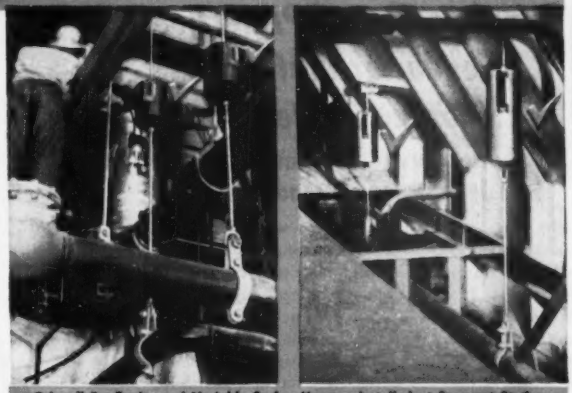
Thermal deflection of piping in today's high pressure, high temperature power stations necessitates flexible support of piping.

Where reactive forces at terminal points in a piping system must be kept within specified limits, constant-support type hangers are recommended. They are designed to provide substantially uniform supporting force equal to the pipe load throughout the travel range and should be used at superheater outlets, turbine connections, and also on high temperature and other critical lines.

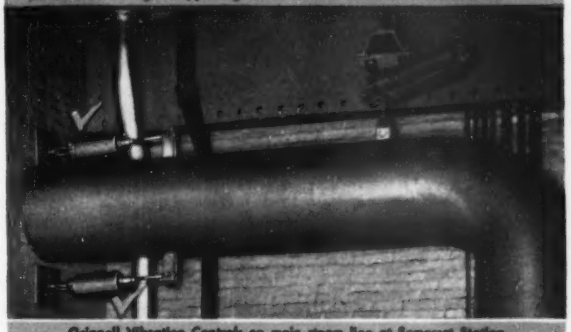
When pipe lines are subject to vertical movement and restrictive conditions do not require the use of a constant-support type, variable spring hangers are recommended. They should be designed to support not less than 85% or more than 120% of the designed load for the total travel.

When necessary to prevent abnormal movement or vibration in pipe lines, controls or sway braces of the energy-absorbing or instant-acting, counter force type are recommended.

Grinnell manufactures a complete line of engineered pipe hangers and supports; maintains a laboratory staff of trained technicians; provides highly skilled assistance and advice right from the design stage; and offers experienced field engineering service.



Grinnell Pre-Engineered Variable Spring Hangers installed at Somerset Station. Left: supporting boiler feed discharge lines, carrying steam at approximately 1785 psi and 455°F. Right: supporting the boiler blow-down header and lines.



Grinnell Vibration Controls on main steam line at Somerset Station.

GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

NOW...CHANCE HOT LINE CLAMPS

offer EXTRA Protection for a better connection

NEW CHANCE PC PROTECTED CONNECTION CLAMPS

Complete Thread Protection ...Conductor Protection ...Contact Protection

for better service, less radio and TV trouble, and longer conductor life

Here are all the features you've wanted in a hot line clamp! Quick tightening USS threads are not only enclosed in a grease chamber to prevent corrosion and sticking, but are also completely protected in the arc zone . . . Your conductor lasts longer because the counter-balanced design and bell-mouth jaws protect against conductor fatigue . . . There's better current distribution, less current loss and less radio interference with the Chance P. C. Clamp—the clamp jaws make complete contact with all outside conductor strands and a heavy weather-protected spring prevents the clamp from loosening on the line. These new clamps are available for either aluminum or copper connections in a complete range of sizes to meet every requirement.

This diagram shows the wide V-shaped jaws that make complete contact and the extra long gripping surface that gives maximum contact with all outside strands throughout the entire conductor range. This gives better distribution of load on the conductor and greater surge protection.

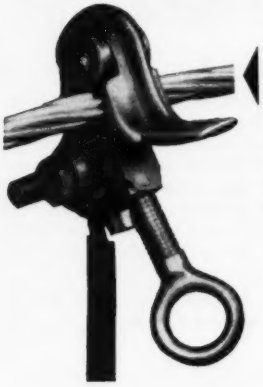
Constantly increasing loads make a really *good* line connection more important every day. Contacts must be tight to reduce the chances for excessive heating at the point of connection. Chance P. C. Clamps do maintain positive contact . . . they will not "freeze" on the line . . . they will not damage or overstress your conductor . . . they give you *extra* protection for a better connection.

Chance P. C. Clamps are worth investigating. Why not write for detailed information today?

You know it's RIGHT when you specify CHANCE.....

Chance Hot Line Clamps are the standard of many companies for all applications. They are moderately priced, yet have quality features that mean better line connections ... high current capacity ... high mechanical strength ... and longer conductor life.

Whatever your requirement—when you specify CHANCE—you can make your selection from *the most complete* line in the industry. Chance Hot Line Clamps are designed on the basis of extensive research and years of connector know-how—they're built by the leaders in the development of hot line clamps.



FLIP-TAP CLAMPS

The Chance Flip-Tap Clamp features a grease chamber, filled with a corrosion resisting compound which prevents the clamp from sticking on the conductor. This clamp is easily guided to the line and is tightened by turning the eye-screw. Jaws of the clamp will take conductors ranging in size from No. 8 solid copper to 4/0 stranded copper or 3/0 ACSR.

PROTECTED CONNECTION CLAMPS

These new Chance hot tap clamps will not "freeze" on the line . . . will not heat excessively . . . will not damage or overstress your conductor . . . and will positively maintain contact throughout the life of the installation. They are available for aluminum or copper connections in sizes to meet every requirement.

PERMA-GRIP CLAMPS

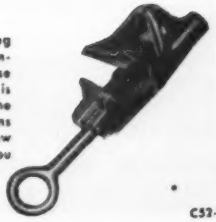
Make permanent or temporary hot tap connections that hold tight without sticking and stay put without vibrating loose. USS threads screw up fast, hold tight . . . yet can be readily unscrewed with a clamp stick. They are available for all types of connections in a complete range of sizes to meet every requirement.

U-BOLT CONNECTORS

These connectors apply to conductors without removing bolts—the swinging center spacer and base eliminate the necessity of removing nuts and lock washers when applying to conductors. No annoyance of losing nuts or washers—application is quicker and easier. Chance U-Bolt Connectors simplify your inventory problems—only *three sizes* are needed. Available for aluminum or copper conductors.

PARALLEL GROOVE CONNECTORS

Inexpensive, easily installed, lightweight connectors for use on line construction. All connector bodies plus galvanized bolts, nuts and lock washers are corrosion resistant. Available in a complete range of types and sizes. Heat treated aluminum, galvanized contact copper, or all copper.



For better hot tapping . . . for permanent connections . . . choose CHANCE. The line is complete, and offers the most advanced designs on the market. You know it's RIGHT when you specify CHANCE.

A·B·CHANCE CO·

CENTRALIA, MISSOURI

SAN FRANCISCO, CALIFORNIA

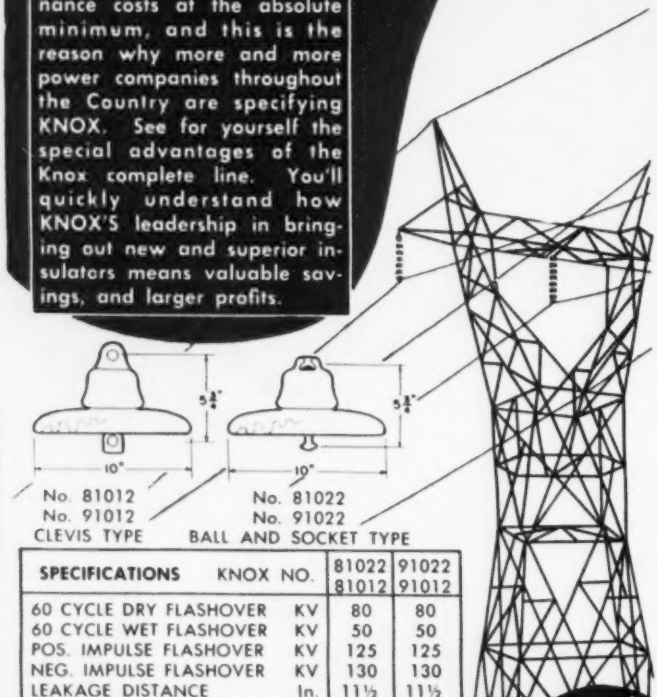
C52-7

SUSPENSION INSULATORS

by KNOX

MADE TO HOLD
MADE TO LAST

KNOX Suspension Insulators are designed and produced to exacting electrical and mechanical standards. These Insulators will keep maintenance costs at the absolute minimum, and this is the reason why more and more power companies throughout the Country are specifying KNOX. See for yourself the special advantages of the Knox complete line. You'll quickly understand how KNOX'S leadership in bringing out new and superior insulators means valuable savings, and larger profits.



No. 81012
No. 91012
CLEVIS TYPE

No. 81022
No. 91022
BALL AND SOCKET TYPE

SPECIFICATIONS	KNOX NO.	81022 81012	91022 91012
60 CYCLE DRY FLASHOVER	KV	80	80
60 CYCLE WET FLASHOVER	KV	50	50
POS. IMPULSE FLASHOVER	KV	125	125
NEG. IMPULSE FLASHOVER	KV	130	130
LEAKAGE DISTANCE	In.	11½	11½
DRY ARCING DISTANCE	In.	7¾	7¾
IMPACT RATING	In. Lbs.	55	90
M. and E. STRENGTH	Lbs.	15000	15000

NEMA STANDARDS

KNOX NO. 10 CATALOG – YOURS FOR THE ASKING

KNOX PORCELAIN CORPORATION
KNOXVILLE 1, TENNESSEE

lighting or telephone circuits dead-ended in residential districts where guys are undesirable or impossible to obtain.

A. B. Chance, Centralia, Mo.

Flexible Pipe

The type WS plastic pipe has been developed primarily for water service installations and high vacuum installations. Increased wall thickness allows pipe to operate at working pressure of 120 psi at 120 F.

Pipe features are flexibility, light weight, absolute resistance to rot, rust and electrolytic corrosion.

Carlon Products Corp, 10225 Meech Ave, Cleveland 5, Ohio

Lamp Starter Reset

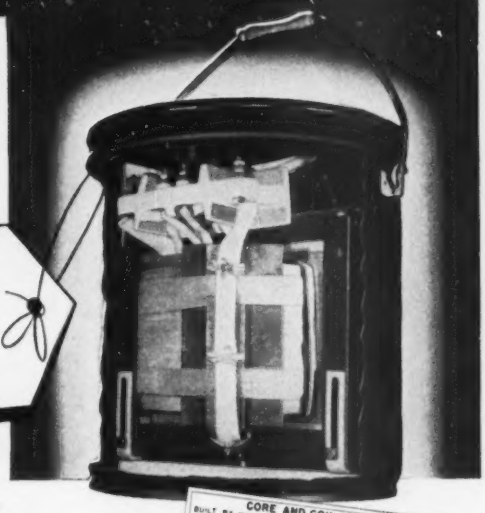
Designed to cut out a failed lamp, the new automatic reset fluorescent lamp-starter protects ballasts from overheating. It also eliminates manual restarting which can be quite costly

Keep your Rural Line Transformers in top condition with *genuine* Wagner Parts

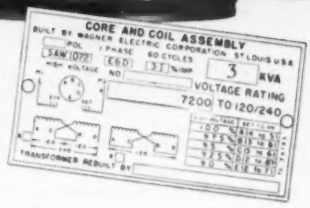
Wagner

Core and Coil Assemblies

Shipped to you in sealed, transformer-oil filled containers
Ready to install without further testing or drying—



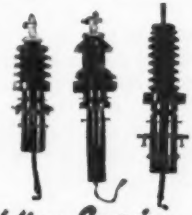
You can renew or up-rate your old or burned out transformers with factory-new Wagner Form W core and coil assemblies, exactly like those used in new Wagner Transformers. It's easy—too. Wagner assemblies come to you complete with terminal board or tap changer, with leads ready to install in your tank. Universal mounting brackets are furnished with each unit to make the installation a simple job. Wagner assemblies have passed complete factory tests—are fully dried—and are packed in Wagner 7N transformer oil, which you may also use in your tank.



New stainless steel nameplates are included with core and coil assemblies.

Wagner Bushing Assemblies

Low voltage bushing assembly includes porcelain bushing, solderless connector-type terminal and clamping device.

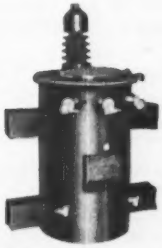


High voltage bushing assemblies in various types meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping device are included—fuses can be furnished when specified.

Wagner *Complete Rebuilding Service*

Including thorough cleaning and repainting, installation of new factory wound coils and insulation, all new gaskets, and a factory inspection. All transformer rebuilding jobs are guaranteed against defective material or workmanship for one year. If complete rebuilding is not necessary, repairs will be made on a time and material basis.

Write for Transformer Repair Schedule



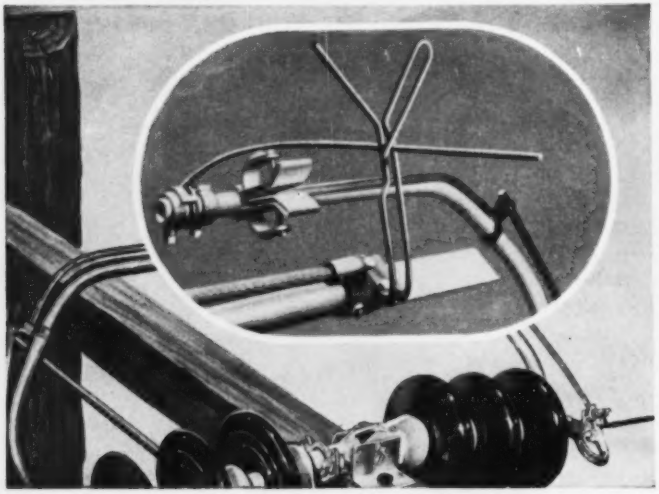
WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

® Wagner Electric Corporation 1891 1951

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

KPF POLE TOP SWITCHES



Drop 40 miles of 69 kv lines with KPF Quick-Break pole top switch

Operating engineers tell us KPF switches with Quick-Break attachment are the most outstanding air-break switch improvement in 25 years. Before development of this Quick-Break device, pole top switching of 69 kv circuits was limited to some 6 miles of line. Now, operating experience shows that 40 miles of 69 kv line can safely be dropped with this equipment.

The secret of the KPF Quick-Break is a heavy-duty cat's whisker which whips free in a split second as the switch is opened. This mechanism prevents establishment of an arc; thus critical arc length is no problem.

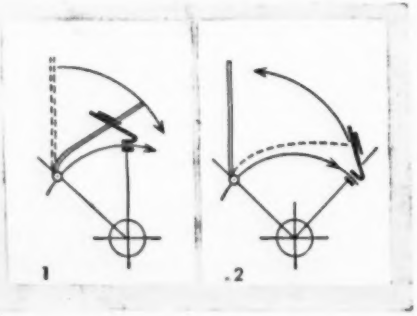
The KPF Quick-Break attachment is simply and ruggedly constructed for low cost, long life and all-weather dependability. It is available for all KPF switches rated 15 to 69 kv.

HERE'S HOW KPF QUICK-BREAK WORKS

1. Spring rod winds to full tension as switch opens.

2. Rod springs clear, breaking contact at high speed.

Write for details of KPF Quick-Break attachment and low cost, long-lasting, easy-to-install KPF Switches.

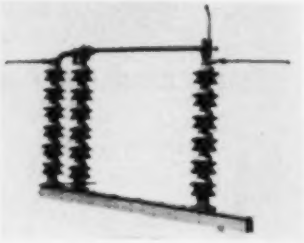


KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, California

when large numbers of lamps have been cut out due to low voltage, ungrounded fixtures, or similar conditions.

For use with 40-w lamps, unit cuts flickering lamps out and lowers the current through the ballast.

Sylvania Electric Products Inc, New York, N. Y.

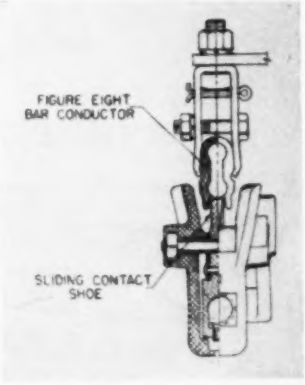


High Voltage Air Break Switch

The type WAG air break switch is now being manufactured in 196-kv and 230-kv ratings. Pictured is the 230-kv, 1200-amp model with outriggers installed.

Switch is a high pressure, vertical break, three insulator switch with center insulator rotating. It is available with or without grading rings. Designed for sectionalizing, main-line disconnecting and by-passing service, the WAG is suitable for use on substations and transmission lines.

Southern States Equipment Corp, Hampton, Ga.



Trolley System

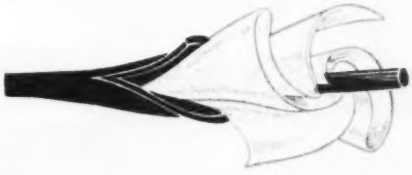
This new trolley system is designed to insulate bare figure-8-bar con-

(*Continued on page* 196)

forget about **this** !

DURALINE* provides added assurance against power outages caused by moisture, whether in the form of rain or sleet or snow. Duraline won't festoon, is more resistant to damage by foreign objects.

install Duraline . . .



DURALINE beats the weather in any season. Its exclusive, continuous interlocked fibrous sheath is thoroughly impregnated with genuine URC saturants and covered with URC finishers.

For the full technical story on Duraline with copper, Copperweld or aluminum conductor, just contact your nearest Anaconda Sales Office. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

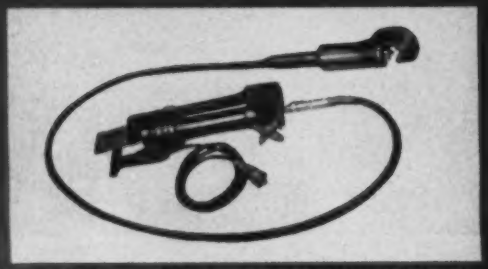
*Reg. U.S. Pat. Off.

the right cable for the job

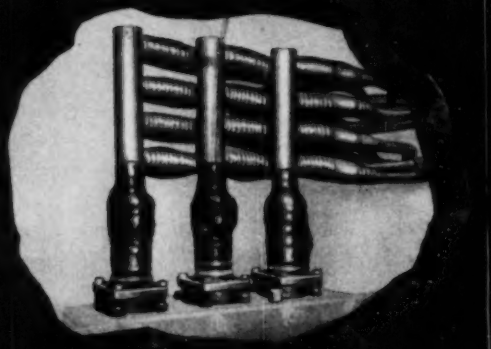
ANACONDA® **WIRE AND CABLE**

BURNDY MOLE LINE EQUIPMENT for

You're always prepared to add new loads to your underground secondary electrical distribution system *rapidly* and *economically* if you install Burndy Mole Line Equipment *from the start*. Engineered to speed up and simplify the connecting of underground cables, Burndy Mole Line Equipment also provides cable protection as well, simply by adding Limiters and Molimiters. That's why Burndy Mole Line Equipment is the *basic connecting system* for utilities that look to tomorrow *—today*.

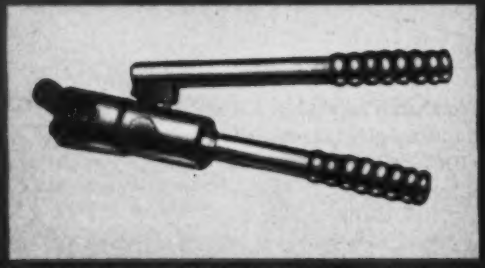


Burndy *foot-operated* hydraulic HYPRESSES install Hycrabs and Hydent connectors on conductor sizes No. 8 through 2000 Mcm. Automatic overload valve controls depth of indentation.

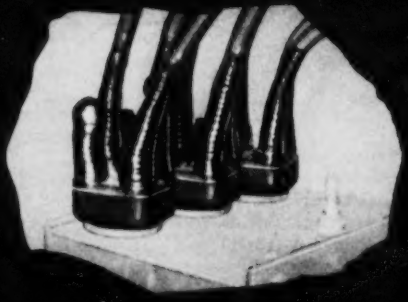


Combination insulated Burndy Stud Mole for terminating copper cables to network protector. Cables are protected by connection to the Stud Mole through Burndy Limiters.

BURNDY HYCRABS are HYPRESSED for



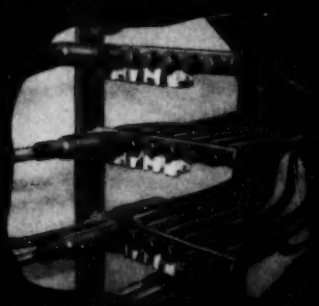
Burndy *hand-operated* hydraulic HYPRESS installs Hycrabs and Hydent connectors on underground cables No. 6 through 500 Mcm. Covered with Neoprene, it is specially suited for close quarters. Develops 9 tons of total force.

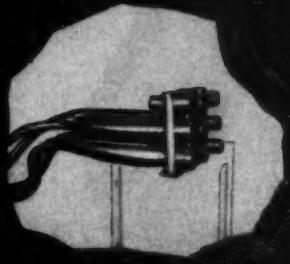


This Burndy Limiter Stud Connector joins four 500 Mcm. cables to the network protector, each cable protected by a fusible section enclosed in an Asbestite shell.

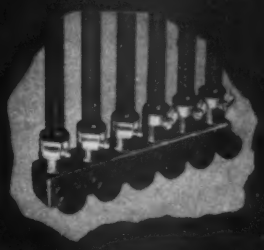
BURNDY

orderly, economical UNDERGROUND expansion



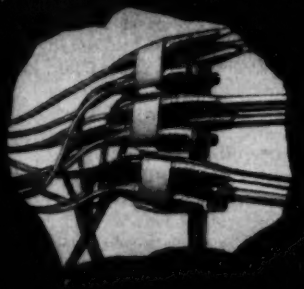


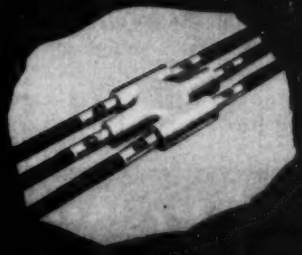
Burndy Molimiters and Moles are used together for cable connection and protection at junction points. Note outlets reserved for future expansion. Burndy Moles and Molimiters are supplied in sizes and types to suit all connection needs in the secondary network.



The Burndy KME Mole is particularly suited to the type of underground system employed in high grade residential areas. Supplied in sizes having 8, 6, or 4 outlets accommodating conductors from No. 8 through 250 Mcm.

quick, low cost connections UNDERGROUND





Burndy Limiter Hycrabs provide limiter protection to cables joined at a single junction point by means of quick, economical Hypress indent connections. Fusible elements have asbestite shell arcing chambers. Entire assembly is insulated.

Burndy Hycrab YM is a compact, multiple, fully insulated crab joint that connects underground cables 4 0 through 500 Mcm by means of Hypress indent connection. Supplied with 4 to 12 outlets. Reserve outlets can be sealed with easily removable plugs.

Now! A HEAVY-DUTY, 4-WAY EXPANDING EARTH ANCHOR FOR POWER TRANSMISSION AND HEAVY DISTRIBUTION LINES

This new P-L 4-way All-Steel, Expanding Earth Anchor is designed for use on power transmission and heavy distribution lines . . . 10" diameter—effective area expanded 200 sq. in. with nominal holding power classification of 20,000 pounds . . . Incorporates ALL the features of the smaller 2-way and 4-way anchors—features proven by use in the past few years in over a million installations . . . Exceptionally rugged and possessed of tremendous holding power, P-L 4-way Anchors are easy to install. A few blows from the spreading tool and the installation is complete, with four blades spread deeply into solid, undisturbed earth. P-L 4-way Expanding Anchors tend to position themselves in soil containing rocks or other obstructions thus greatly improving holding power. Solve your guying problems by installing P-L Anchors. Write today or contact your preferred distributor for information and literature. PL51-1

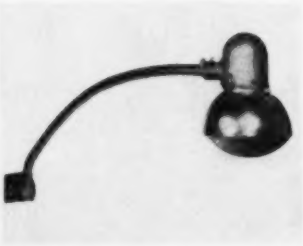
PIEPER-LILLARD, inc.

ST. LOUIS 22, MISSOURI

MAKERS OF P-L 2-WAY ANCHORS • WIRE STRINGING PULLEYS
CHAIN BINDERS • SPREADING TOOLS • SADDLE ASSEMBLIES

ductors for maximum safety at minimum cost. System can be installed quickly and easily, and consists of a sheath of insulation material and a sliding shoe collector.

Benbow Mfg Co, 1285 Rollins Rd, Burlingame, Calif.



Aluminum Bracket

This lightweight aluminum bracket consists of a cast aluminum base and specially designed aluminum alloy bracket arm that can be folded against the building wall for easier servicing. Device can be used with all types of luminaires.

Bracket is rustproof and easy to mount because of its light weight.

Nepo Mfg Co, 527 So. Wells St, Chicago 7, Ill.

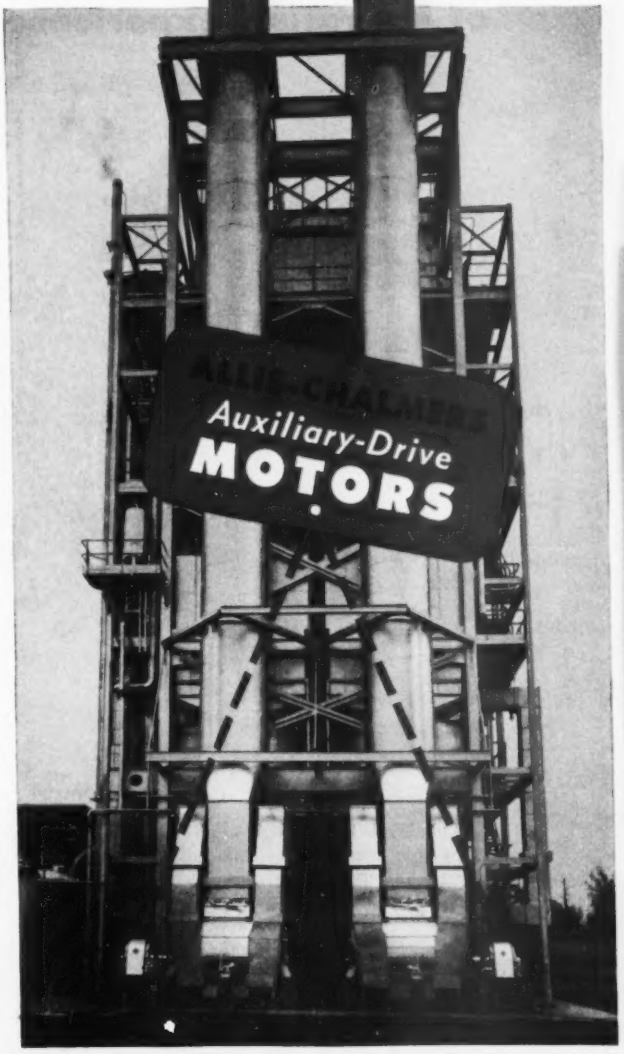
MORE NEW PRODUCTS

about which you should know

Russell and Stoll Co, 125 Barclay St, New York 7, recently developed an explosion-proof, **swivel-type flexible lighting fixture.** Fixture conforms to requirements for Class I, Groups C and D hazardous locations. Swivel joint is not subject to mechanical injury, and unit has swing of 30 deg.

U. S. Electrical Motors Inc, 200 E. Slauson Ave, Los Angeles 54, Calif., has designed a method for **preventing reversal of vertical hollow-shaft motors.** Method prevents damage to pump bearings when a vertical turbine water pump back-spins upon loss of voltage . . . Gedney Electric Co, RKO Bldg-Radio City, New York 20, N. Y., has developed a new **electrical conduit fitting.** Called the Equal Ell, it reportedly can almost always be used to replace ordinary LL and LR conduit bodies, thus reducing stock requirements of suppliers.

No "Cover" Charge Here!



THE INDUCED-DRAFT FAN MOTORS look pretty small right out in the open air at the base of the towering stacks. But with today's building costs there would have been nothing small about the "cover" charge for brick and mortar walls and a steel-braced roof to house the motors.

Fortunately, modern Allis-Chalmers auxiliary-drive motors need no costly enclosures.

You can count on Allis-Chalmers motors for the kind of operation you need for continuous power generation . . . because A-C has the experience essential to designing and building motors for outdoor use.

For many years, A-C has been supplying splash-proof motors for a variety of outdoor applications. Since 1946, *tube-type* totally-enclosed fan-cooled motors have been available for operation under the most severe conditions indoors or out. And Allis-Chalmers is now offering *weather-protected* motors especially developed for modern outdoor power plants.

Talk Over Your Needs

All three types are available in sizes and speeds to meet all major auxiliary-drive requirements. Your nearby A-C representative can help you select the motors that will best fit your needs for money-saving outdoor installations. Allis-Chalmers, Milwaukee 1, Wis.

Two 450-hp, 695-rpm, splash-proof cage motors driving induced-draft fans — as well as other Allis-Chalmers auxiliary-drive motors — are installed outdoors at the Natchez Steam Electric Station of the Mississippi Power and Light Company.

A-3633

ALLIS-CHALMERS

14 YEARS

of operating experience with STEAM over

2000 PSI

An important element in successful high-pressure operation is the B&W Cyclone Steam Separator, developed by B&W Research. This simple, highly efficient device is typical of the manner in which B&W's progressive research pushes the science of steam generation to ever higher levels of economy.

For those seeking the high steam-cycle efficiencies obtainable with steam pressures over 2000 psi, B&W offers unparalleled design and operating experience . . . drawing upon a background extending over the last 14 years with units to serve over 8,000,000 kilowatts of generating capacity.

The outstanding performance records of the 12 B&W installations already operating in this range have given strong impetus to the present trend toward use of pressures over 2000 psi . . . have resulted in orders for more than 50 additional B&W units with design pressures up to 2700 psi.

B&W's many years of experience in designing and building boilers for economical, high-pressure steam generation, as exemplified in the list on the opposite page, are at your service.

B&W BOILERS WITH DESIGN PRESSURES OVER 2000 PSI

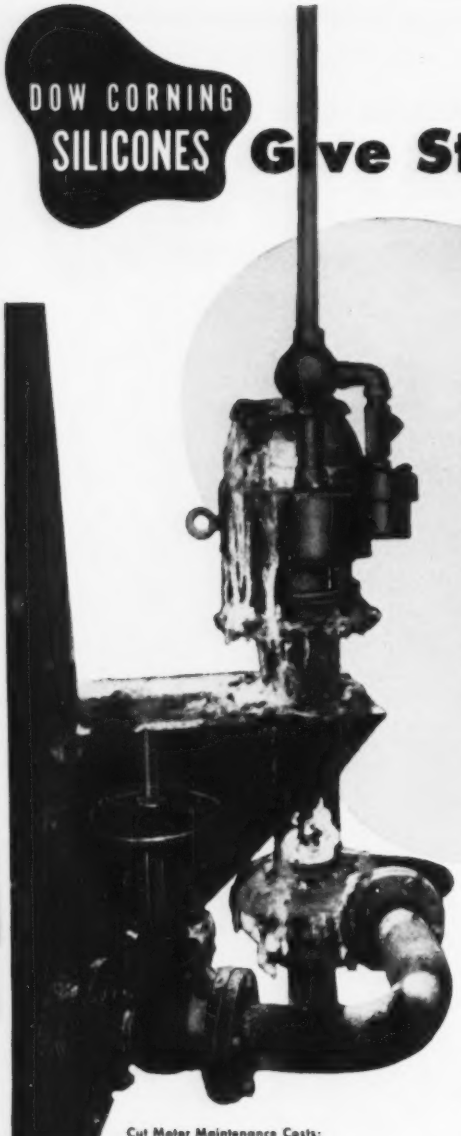
Owner	Boiler Design Pressure
Diamond Alkali Co.	2200
Indiana & Michigan Electric Co.	2650
Appalachian Electric Power Co.	2300
Indiana & Michigan Electric Co.	2300
The Ohio Power Co.	2300
Commonwealth Edison Co.	2125
Indiana & Michigan Electric Co.	2300
Appalachian Electric Power Co.	2300
Commonwealth Edison Co.	2125
The Ohio Power Co.	2300
Public Service Co. of No. Illinois	2050
Indiana & Michigan Electric Co.	2300
Consolidated Edison Co. of N. Y.	2050
Philadelphia Electric Co.	2075
Consolidated Edison Co. of N. Y.	2050
Pennsylvania Electric Co.	2080
Philadelphia Electric Co.	2075
Detroit Edison Co.	2050
Appalachian Electric Power Co.	2400
Commonwealth Edison Co.	2125
Tennessee Valley Authority	2050
Commonwealth Edison Co.	2125
Detroit Edison Co.	2050
Jersey Central Power & Light Co.	2225
Georgia Power Co.	2100
Southern California Edison Co.	2050
Narragansett Electric Lighting Co.	2350
Public Service Co. of No. Illinois	2125
Tennessee Valley Authority	2050
Ohio Edison Co.	2300
Pacific Gas & Electric	2050
Public Service Elec. & Gas	2700
Appalachian Electric Power Co.	2400
Tennessee Valley Authority	2050
Tennessee Valley Authority	2050
Georgia Power Company	2100
Tennessee Valley Authority	2050
The Ohio Power Co.	2400
The Ohio Power Co.	2400
Ohio Edison Co.	2300

TOTAL GENERATING CAPACITY SERVED: OVER 8,000,000 KILOWATTS.

G-3637

DOW CORNING
SILICONES

Give Standard Motors More Stamina



They saved $2100 and got greater overload capacity by rewinding with Class H insulation

Increased production schedules made it necessary to get 50% more pumping capacity out of a line of 22 mixing pumps. Exposed to outdoor weathering and to a variety of soluble salts, these pump motors rated at 2 h.p. were already taking all the punishment they could stand. Estimated cost of new 3 h.p. motors, plus installation of new mounts and brackets was $4400. Rewinding the old motors with Dow Corning (Class H) insulation, plus re-installation on the original mounts came to only $2300. That's a saving of $2100, plus a bonus of greater overload capacity and better chemical resistance.

The fact that Class H insulation has been used so successfully to up-rate motors proves that Dow Corning Silicones give standard motors more stamina. That means you can eliminate most of your repeated motor failures by specifying Class H insulation. That includes failures due to high ambient temperatures as well as high operating temperatures caused by overloads, high starting loads or rapidly reversing service; failures due to a combination of heat and excessive moisture or corrosive atmospheres. Pump motors, fan and blower motors, motors driving centrifuges or crane hoists, traction motors and motors in reversing service can be given as much as 50% more overload capacity. Life expectancy of Class H insulation made with Dow Corning Silicones is in the range of 4 to 100 times the life of Class B insulated equipment under comparable operating conditions. And Class H costs very little more than the second best class of insulation.

Cut Motor Maintenance Costs;
Increase Productivity.

MAIL THIS COUPON *Today*

Dow Corning Corporation, Dept. AY-16

Please send me

- ☐ More information on Class H Insulation
- ☐ List of Class H Rewind Shops
- ☐ Sources of supply for new Class H Equipment

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

DOW CORNING CORPORATION
Midland, Michigan

Atlanta • Chicago • Cleveland • Dallas
Los Angeles • New York • Washington, D. C.

In Canada: Fiberglas Canada Ltd., Toronto • In Great Britain: Midland Silicones Ltd., London

WHAT THEY'RE SAYING

At Industry Meetings

Reaching beyond Our Reach

HILAND G. BATCHELLER, Chairman of the Board, Allegheny Ludlum Steel Corp, before the American Assoc for the Advancement of Science, Phila., Pa.

While great strides have been made in the past, we can no longer depend on the usual process of mixing the elements into new compositions and putting them through variations of conventional heat treatments in order to improve their properties. In the future we can expect the physicist to trace down the reason for super electrical conductivity, and an increasingly rapid use of radioactive isotopes as tracers in research and process control. An application of ultrasonic energy and the use of electron beams in steel production, metallurgy, and the fabrication of metals can also be foreseen. So, as great as the industry will stand with its 120 million tons of annual capacity, we are merely on the threshold of even greater technology.

Gas Turbine Development

F. T. Hague, aviation and gas turbine consultant for the Westinghouse Electric Corp before the American Society of Mechanical Engineers at Seattle, Wash.

Facility-wise, the United States has the laboratory capacity to do an outstanding development job on the gas turbine. Attainment of the full theoretical possibilities of the new type unit however, requires the building of research laboratories where rational development of all components can be pursued, free of the interruptions and limitations of shop production.

The gas turbine can be designed to use any one of a wide variety of fuels ranging from residual fuel oil to coal and future improvements are more promising for the gas turbine than any other heat engine.

Air Locks in Ventilation Systems

W. W. McINTOSH, staff engineer, General Electric Co, Richland, Wash., before the American Society of Mechanical Engineers.

"Air locks" between "hot" (contaminated) and "cold" (uncontaminated) pressurized zones are being

YORK-HOOVER

IS PROUD TO ANNOUNCE

THAT 1952 IS ITS

60th *Anniversary Year*

Light Duty Public Utility Service Body

Heavy Duty Line Construction Body

We have attained this milestone of progress through the loyalty and confidence of our customers . . . plus strict adherence to an iron-clad policy established in 1892. That policy is to produce only quality merchandise at a fair price . . . at all times . . . and under any conceivable economic condition.

Consistent with these policies and objectives, York-Hoover has grown, in 60 years, to be a virile, progressive manufacturing organization . . . a great family of fine craftsmen . . . whose contribution to the industries we serve is reflected in the cost-saving efficiency of York-Hoover Truck Bodies wherever they are used.

We are grateful for the privilege of serving you during the past 60 years and will continue to serve you faithfully during the years to come.

1952...OUR 60TH ANNIVERSARY YEAR

YORK-HOOVER CORPORATION

YORK, PENNSYLVANIA

Simple, Trouble-Free Aerial Service Unit—by EAGLE

LADDER EXTENDED

THIS combination ladder and all-purpose service body unit can be mounted on 1/2 and 3/4 and 1 ton trucks — a mobile, aerial service unit with a wide range of usefulness.

Extension ladder available in 24 ft., 28 ft., 32 ft. and 36 ft. lengths. Provides aerial equipment with no mechanical devices subject to breakdown or requiring maintenance attention. One-man operated — ladder easily extended or lowered and closed. Ladder is mounted clear of body floor. Service body offers safe, weather-proof storage compartments for tools and materials — available in 74 inch, 84 inch, and 94 inch lengths. Send for complete information on the Eagle Aerial Service Unit.

LADDER CLOSED

EAGLE

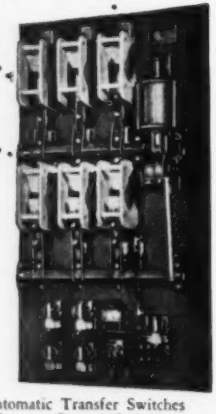
EAGLE MANUFACTURING CO.
Division of
The Four Wheel Drive Auto Co.
APPLETON, WISCONSIN

Utility Bodies • Trailers • Pole Derricks
Tools and Accessories
Eagle equipment is engineered by and for utility men expressly for their needs

Distributed by GRAYBAR

Send today for the complete catalog of Eagle Line Construction and Maintenance Equipment — a useful reference book.

HEADQUARTERS FOR
AUTOMATIC TRANSFER SWITCHES



We can take care of almost any Automatic Transfer Switch requirement ranging from 5 to 1000 amperes. For example, Bulletin 906-105S, as illustrated, is a 300 ampere unit installed in a specially narrow panel for a distribution control center

Standard features on control panels can include phase failure protection, indicating auxiliary contacts, engine starting contacts and push buttons for engine tests, reset to normal and load transfer. Special features include delayed operation, manual emergency handles, low frequency relay protection. Condensed Catalog No. 700 gives a comprehensive picture of our work along the line of Automatic Transfer Switches and complete Electromagnetic Control Panels.

If you require any type of automatic control, write us. Our 60 odd years of broad experience in the field of Electromagnetic Controls should be helpful.

Automatic Transfer Switches
Remote Control Switches
Contactors Relays
Specialized Electromagnetic Controls

We also manufacture a complete line of Solenoid Operated Valves for Automatic and Remote Control of Liquids and Gases.

AECA Electro-Magnetic CONTROLS

S-50-3

Automatic Switch Co.

397-E LAKESIDE AVENUE · ORANGE, NEW JERSEY

used to protect personnel against deadly air borne contamination in atomic plants and laboratories. New materials produced by nuclear fission, more poisonous than anything previously known, are being processed on an industrial scale, and call for extraordinary measures to provide adequate protection for personnel working in close proximity with this type of substance.

An efficient ventilation system is the best protective measure that can be taken. In addition new design must take into consideration all types of accidents such as explosions, fires, spills, and errors by the personnel, if maximum safety is desired.

And Be Neighborly

J. CARLISLE McDONALD, assistant to the chairman, U. S. Steel Corp, before panel on community relations at Annual Business Management Institute of Bryant College, Providence, R. I.

A company's standing with its public nationally is determined largely by the place it holds in the opinion of its neighbors in the plant community.

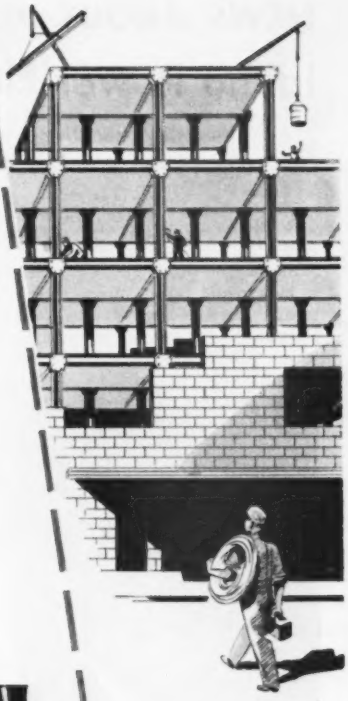
The employee has definite opinions based on his own experiences of the working conditions and the management's attitude towards the employees. The resident of a plant community bases his opinion on plant's readiness to aid the community in charitable undertakings, social and cultural progress.

The customer judges plant by the quality of its product and the service that is rendered, such as technical advice and prompt deliveries of ordered products.

All these people are influenced by the plant's representatives regardless of the position they hold within the corporation. In a sense then, every employee of the plant is a public relations representative. All these things add up to the fact that the first requisite to good Public Relations is good management. Public Relations is not just advertising or publicity, but a way of conducting business and a consideration of public interest in the formulation of every business policy.

The main objective of Public Relations of U. S. Steel and all industry is to obtain favorable public opinion for their organizations. In doing so an important service is rendered to American business.

PROVIDE FOR 50% MORE FUTURE LOAD GROWTH WITHOUT USING MORE COPPER OR STEEL ...WITH ROCKBESTOS Hi A.V.C.®



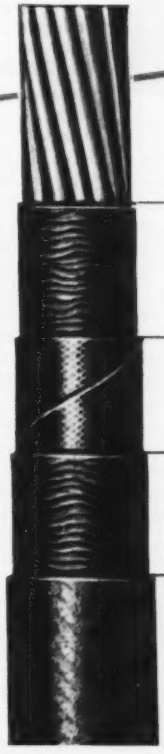
Electrical load requirements of a new building are anticipated during the design stages... but will it be enough years from now.

By simply using Rockbestos A.V.C. on the same size (size for size basis as R or RH), you automatically provide for up to 50% future growth. And remember, you get this important additional current capacity without using any more critical copper or steel.

Consult your nearest Rockbestos Representative or write.

Hi ...Your best buy

ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT
the originators of A. V. C.®
New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
New Orleans • Los Angeles • Seattle • Oakland, California



IT'S THE A.V.C. "SANDWICH"
that makes the difference

Inner Felted Asbestos Wall

Varnished Cambric

Outer Felted Asbestos Wall

This "sandwich" protects the varnish cambric. It enables A. V. C. to carry more current than cables with conventional insulations.

NEWS ABOUT PEOPLE

Idaho Power Elects Gale a VP

The utility executive brings farm experience to the position. He will continue to direct sales department

Reared on a farm in Anoka, Minn., Ralph E. Gale comes to the vice presidency of Idaho Power Co with a background which gives him a broad understanding of the farm problems of the agricultural Snake River Valley. This background has

R. E. GALE

also given impetus to the leadership in the Idaho farm chemurgy program that was instrumental in establishing a profitable potato starch industry in southern Idaho.

Served as Distribution Engineer . . . The new vice president, who has been serving as assistant to the president, started his career with Idaho Power in 1921. After special engineering study at the University of Washington in 1922-23, he served in various engineering and sales posts. In 1926 he took a leave of absence from Idaho Power to work for a year as distribution engineer for Florida Power & Light Co.

Gale became general sales manager of the Idaho utility in 1936. When he was made assistant to the president in 1949, he continued to have supervision of company sales, industrial promotion, and the research programs, particularly in the field of chemurgy. As a vice president, he will continue to direct the activities of the sales department in addition to the duties of his new post.

During World War I he served with the Signal Corps of the 6th Regiment of the U.S. Marine Corps.

A member of the Northwest Electric Light and Power Association, Gale is now serving as first vice president. He also has served as executive secretary of the Idaho Chemurgic Council.

New Officers Elected

Howard N. Walters, general sales manager, British Columbia Electric Co, Vancouver, B.C., has been elected president of the Electrical Service League of British Columbia. W. W. Foster, British Columbia Power Commission, Victoria, has been named vice president. Richard Hall, illumination engineer, B.C. Electric, continues as secretary-manager of the league, a post he has held since its inception. A. E. Crauer, president of the British Columbia Electric Railway Co, was named honorary president.

Charles N. Knapp, former district engineer for the Lamp Division of General Electric Co, has been appointed vice president and general manager of Butler Manufacturing Co, Charlotte, N. C., producers of fluorescent lighting equipment. He was with GE for 33 years before his retirement in February.

Chris H. Bartlett has been appointed manager of Westinghouse Electric Corp's Transformer Division. Bartlett, who has been serving as sales manager for the division since 1949, joined Westinghouse in 1928.

W. R. Yorkey has been appointed sales manager of Electric Controller & Manufacturing Co, Cleveland, Ohio. **R. J. Lincoln** will succeed Yorkey as district manager of the New York office. The new sales manager, who has served in the New York post for several years, started with EC&M in 1918. Lincoln has been in the New York office since he joined the company in 1931.

Ernest A. Wagner has been appointed manager of engineering for General Electric Co's Allentown plant. Wagner, who has been engineer of the home laundry equipment department, has been with General Electric since 1935. During World War II he was project engineer on the firm's torpedo project.

Womer Is Elected a VP by Pennsylvania Electric

Frank W. Womer, manager of the Central and Southern Divisions of Pennsylvania Electric Co, has been elected vice president of the Northwestern Division at Erie, Pa.

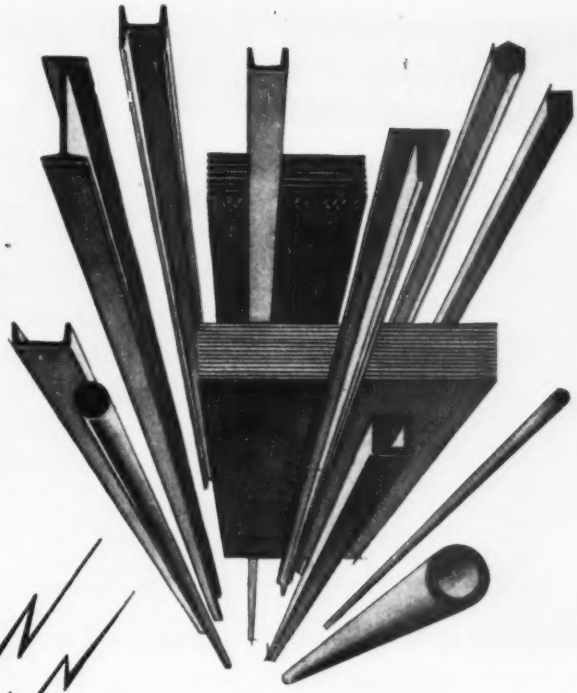
The company also has announced the appointment of William J. Utts as manager of the newly formed Southern Division at Johnstown, and Royal A. Pickup as manager of the enlarged Northern Division at Oil City. Utts has served as assistant manager of the Central and Southern

F. W. WOMER

Divisions, now the new Southern Division. Pickup has been the Keystone Division manager, now included in the Northern Division.

Starting his utility career in the meter department of the old Penn Public Service Corp in 1914, Womer later served as shop foreman and meter engineer before being named

STEEL for UTILITIES



In stock...Prompt shipment

When you call Ryerson for steel, you can be sure of prompt, personal service from the minute your call comes in. With the exception of those few items remaining in short supply, we can fill all your orders quickly from stock on hand. And to assist you on any problem of steel procurement, application or fabrication, the friendly counsel of experienced Ryerson specialists is always yours for the asking.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

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JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND
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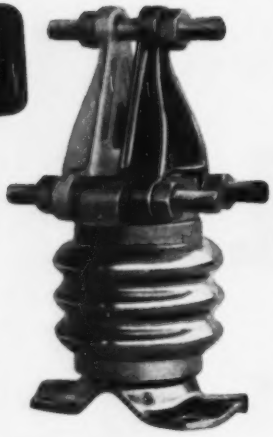
A STANDARDIZED UNIFORM PRODUCT



The "Three E" Form A-1 line of INDOOR BUS SUPPORTS are designed to meet the operating conditions encountered in medium* size power plants, substations, customers vaults, etc.

They are available in voltage ratings of 5000, 7500, 15000 and 23000. Clamps can be had for flat bar (vertical or horizontal) tubing, rod, cable or other styles of conductors. Mounting bases are adaptable to pipe or flat surface mounting. The insulator unit is of high grade wet process porcelain, brown glazed.

This style of bus support has been in active production for almost thirty years. Thousands of them are in service.

Our ample stocks enable us to make prompt shipments.

*A line of heavy duty bus supports are available for large power installations.

Ask for new bulletin 226. It describes this line completely.

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

HIGHER QUALITY
AT LOWER COST!
with
BLACKBURN
Hi-Strength
Ground Rod Clamps
TYPE A
The complete line of clamps is cast of high-strength Duronze and uses Duronze set screws — truly high-strength construction throughout. Type A is a heavy clamp with floating pressure bar to align and protect the ground wire. Type B is the "Budget Line" clamp, but it makes a tight, trouble-free connection. For higher quality at lower cost, specify BLACKBURN.
JASPER BLACKBURN CORPORATION
MADISON ST. • ST. LOUIS 6, MO.

district manager at Indiana in 1922. He was made Southern Division manager in 1943 after serving as district manager at Somerset and Johnstown. In 1944 he was named manager of the Central and Southern Divisions.

Utts joined Penn PS as district supervisor in 1920. After serving as district manager in various locations, he was made assistant division manager at Clearfield in 1944 and was named to his present post in 1945.

Pickup began with Penelec in 1923. He was made a district manager in 1924 at Corry and in 1926 at Meadville. In 1942 he was named assistant division manager at Erie, in 1944 district manager at Oil City, and in 1946 to his present position.

Graybar Electric Names W. E. Henges President

Willard E. Henges has been elected president of Graybar Electric Co. New York. He succeeds Alfred H. Nicoll, who also will continue as chairman of the board.

Henges, who became vice president in 1950, joined Graybar 39 years ago as a receiving clerk in St. Louis, Mo.

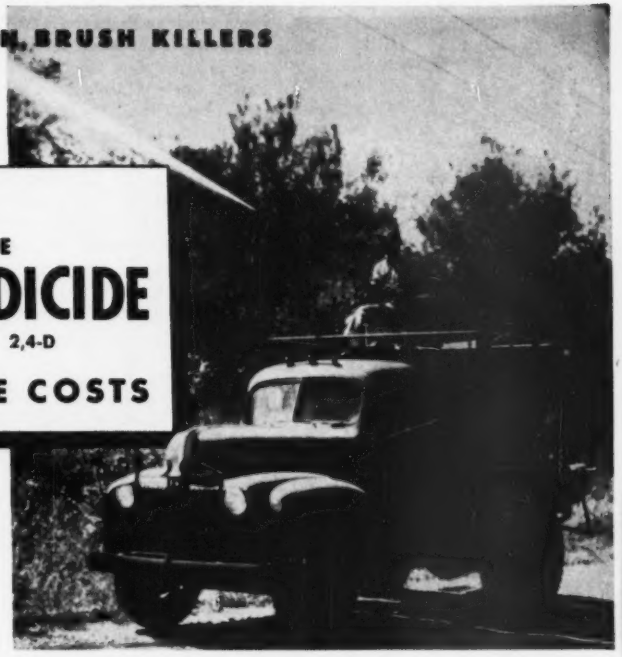
W. E. HENGES

He became a salesman in 1919 and assistant manager in 1936. Six years later he was made district manager at St. Louis. In 1944 he was transferred to Cleveland in the same capacity. He was elected a director of the company in 1949 and early last year was elected a member of the executive committee.

Nicoll, who was elected president of Graybar in 1941, started with the company in 1911. He became district

Thompson Chemicals

FIRST NAME IN BRUSH KILLERS



New....Superior

LOW VOLATILE

BRAMBLE-WEEDICIDE

2,4,5-T **2,4-D**

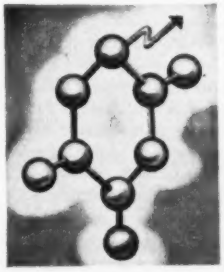
CUTS CLEARANCE COSTS

- **PENTYL ESTERS FOR LOW VOLATILITY**
- **EXTRA HIGH SURFACE CREEP FOR EXTRA KILL**
- **ABSORPTION RATED FOR EFFICIENT WOODY GROWTH CONTROL**

Delivers More Killing Units Per Dollar

Bramble-Weedicide, the new, improved Thompson brush killer specially recommended for clearing rights of way, is 70% more economical than mechanical or hand clearing methods. Up to 25% more effective and economical than older chemical controls.

Whether you spray foliage by air, truck or tractor or from knapsack, or employ basal bark treatment, you get positive kills of even hardiest species at lowest cost per mile with Thompson's superior Bramble-Weedicide.



Special low volatile tailor-made pentyl esters, absorption rated for quicker translocation, more effective results. An exclusive creeping agent adds increased surface contact on leaf or stem for extra action.

Write, describing nature of growth and type of job for helpful information on what to apply, how to mix and when to spray for maximum economy and effectiveness. Thompson manufactures many kinds of brush and weed killers. Caution: Order NOW to be assured of ample supply.

DISTRIBUTORS: SOME TERRITORIES STILL OPEN

Thompson Chemicals

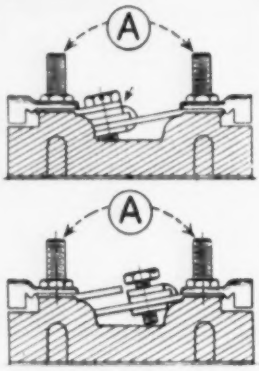
other superior

WEED & BRUSH KILLERS

- **WEEDICIDES:** 2,4-D Esters and Amines
- **BRAMBLCIDE** 2,4,5-T Low Volatile Ester
- **PHYTOCIDE** } General Weed Killers
- **PENTA-WEEDICIDE** }

Thompson **CHEMICALS CORP.**

St. Louis 3, Missouri
Los Angeles 27, California



LOOK HOW EASY!

(1) Just attach instrument to terminal posts,

(2) Slide link out of contact — take reading,

(3) Slide link back and bolt in position.

All testing done without touching permanent wiring. Built in any number of poles desired, front or back connected, with or without coding strip, with or without cover.

THE STATES COMPANY

Cut Out and Mail Today to

THE STATES COMPANY
3 New Park Avenue
Hartford, Conn.

Please send Cat. No. 1, Sec. 6, for further information.

Name ... Title ...
Firm ...
City ... Zone ... State ...

manager at San Francisco in 1932 and was appointed assistant to the president in 1939. One year later he was elected vice president.

Sol E. Shultz, chief engineer, has been appointed acting assistant administrator to Paul J. Raver, Bonneville administrator. He replaces **D. L. Marlett,** who has resigned. Schultz, who also will continue his work as chief engineer, came to Bonneville in 1939. Previously he was chief engineer for the Port of New York Authority.

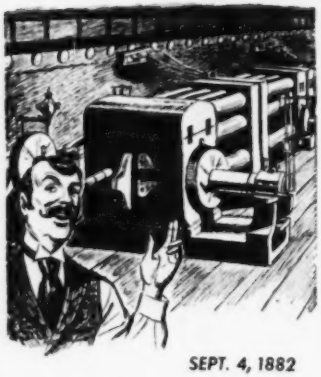
Bud S. Moss, agricultural agent of Georgia Power Co since 1948, has been named manager of the rural division, succeeding **L. W. Gray** who has retired after 26 years service. Moss, who joined Georgia Power in 1946 as rural engineer in Columbus, will have charge of the company's rural electrification promotion as well as general agricultural activities.

H. S. Kilby, formerly vice president of Western Light & Telephone Co, Kansas City, Kan., has joined Public Service Co of Oklahoma as assistant to the president. Kilby is organizing the company's industrial development department. When he was made a vice president of Western L&T in 1945 Kilby was put in charge of operations.

Percy George, former mayor of Victoria, has been appointed chairman of the British Columbia Public Utilities Commission, succeeding Dr W. A. Carrothers, who died last year. George also was appointed sole member of the Coal & Petroleum Control Board, succeeding Carrothers.

Gordon D. Hulme, manager of the public relations and advertising department of Shawinigan Water & Power Co, Montreal, Que., has been appointed an assistant vice president. Hulme, who joined Shawinigan in 1931, was made head of public relations and advertising in 1945. **Louis Trudel** succeeds Hulme.

John M. Drabelle, mechanical and electrical engineer for the Iowa Electric Light & Power Co for the past 34 years, has retired. Drabelle started his utility career in 1910 as a draftsman with Cedar Rapids & Iowa City Railway & Light Co. He joined Iowa



SEPT. 4, 1882

World's largest dynamos

Capacity: 5,000 lights each

When Thomas Edison opened the Pearl Street Station of the Edison Electric Illuminating Company on September 4, 1882, the station contained the largest dynamos in the world. These six "jumbo" dynamos had a capacity for 5,000 lights each. Fifty-nine users made up the customer list of this first electric lighting plant. Within fourteen months, the company had 508 customers using 12,732 electric lights.

Hemingray started making pole-line insulators twelve years before the Pearl Street Station. It was natural, then, when insulators were needed for newly born electricity, that Hemingray should apply its experience and knowledge to making them. Continuous research and testing, careful quality control and thorough individual inspection through the years have made the name Hemingray synonymous with leadership and progress in glass insulator manufacture.

HEMINGRAY
POWER INSULATORS
AMERICAN STRUCTURAL PRODUCTS COMPANY
Muncie, Indiana

Subsidiary of Owens-Illinois Glass Company

Electric L&P in 1911 as a construction engineer. He is the designer of automatic control systems for hydroelectric plants. He is a past president of the Iowa Public Utilities Association.

OBITUARY

Wallace W. Glosser

Wallace W. Glosser, 65, a vice president and director of Hubbard & Co, Pittsburgh, Pa., died March 21.

After serving with the Verona Tool Co, Glosser started with Hubbard in 1927 as district manager of the New York Office. A year later he was transferred to the Pacific Coast as manager of Hubbard's plant at Oakland. In 1942 he was made a vice president in charge of the Oakland Branch. Glosser was elected as a member of the Hubbard board of directors in 1948.

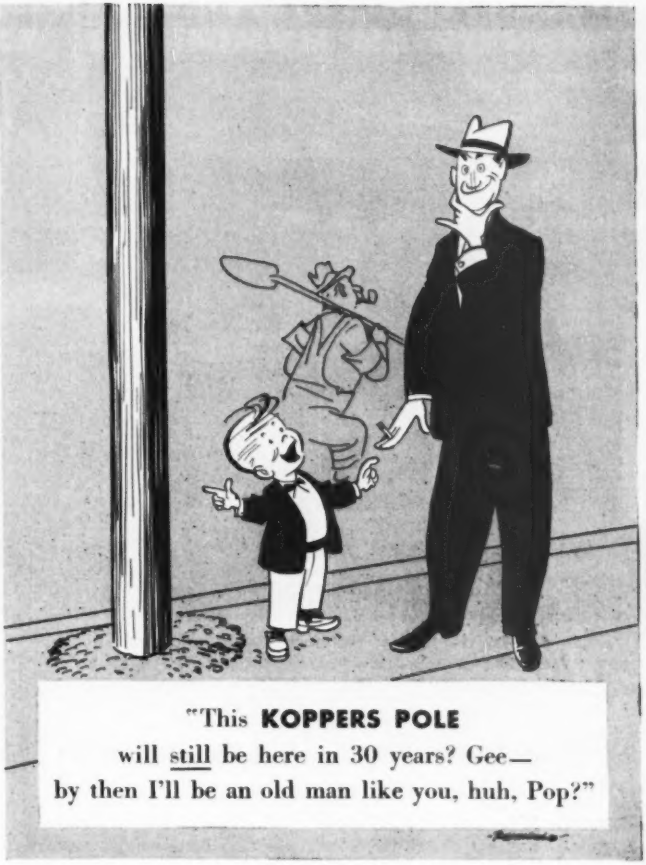
Richard Townsend, 68, for 15 years a hearing examiner with the Securities and Exchange Commission, died at Washington, D. C., March 16. Townsend presided over many important cases, the most recent being the disposal by the American Power & Light Co, New York, of stock of the Washington Water Power Co, Spokane, Wash. He practiced law in Pittsburgh and New York City from 1910 until 1935.

Arnold Edison Haire, 41, an electrical engineer with City Light at Tacoma, Wash., died there March 20. He served in the Navy during World War II, retiring with the rank of lieutenant commander.

Col John Millis, 93, retired engineering officer of the Army, who was in charge of the installation of the electric lighting of the Statue of Liberty in 1886, died at Cleveland, Ohio, March 20.

Charles A. Eggers, 67, retired supervisor of construction for Detriot Edison Co for 27 years, died recently at Detroit, Mich. He retired two years ago.

Russell B. McCann, 55, chief engineer at the Rome (N. Y.) division of Revere Copper & Brass, Inc, died March 16 at Rome, N. Y.



● Sonny doesn't realize it now; but, in all probability, he and this Koppers Pole will *both* be young thirty years hence.

Koppers Pressure-Creosoted Poles are famous for the way they last; for the way they provide long periods of dependable service; for the way they make line operation easier, better, more economical.

Specify Koppers Poles! These strength-retaining poles will cut your maintenance and replacement expenses.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-CREOSOTED WOOD

DEMONSTRATE-TO-SELL, theme of Westinghouse Electric Corp's Appliance Division sales training film, "Ellis in Freedomland," is emphasized in a scene from the film by a dealer and a Westinghouse distributor salesman portrayed by Robert Carson, left, and Robert Rockwell

'Freedom Fair' Is Launched

To launch the spring promotion campaign of major appliances, Westinghouse Electric Corp staged a premiere of its Appliance Division's "Freedom Fair" at a recent sales rally at the Barbizon-Plaza Hotel, New York.

Key points of the campaign, as outlined by T. J. Newcomb, sales manager of the division, are an intensive sales training drive and a national dealer promotion.

Explains "Freedom Fair" . . . Newcomb explained that the "Freedom" stands for the freedoms that modern appliances give to the homemaker and the "Fair" means the open houses that dealers will hold to bring the public into their stores.

This national program, in which Westinghouse has invested $250,000, calls for a motion picture training program that includes a news reel, a sports reel, a coming attractions trailer, and a feature picture in full color, "Ellis in Freedomland."

According to Newcomb, the motion picture program will permit the full training of 25,000 dealers and salesmen within one week's time.

"Don't Meet Competition . . . Make It," the 1952 sales theme, is played up in the sports reel narrated by Mel Allen, sports commentator.

Stars Perform . . . Outstanding movie and television stars highlight "Ellis in Freedomland," based on a dealer's realization that to sell merchandise he had to "demonstrate-to-sell." Eight products "tell their story" through the voices of Edward Arnold, as the electric range; James Mason, refrigerator; Jerry Colonna, Waste-Away food disposer; Andy Devine, water heater; Percy Kilbride, dehumidifier; Maureen O'Sullivan, dishwasher; Lucille Ball, Laundromat automatic washer; and Marie Wilson, electric clothes dryer.

The campaign will kick off on the same date, April 14, throughout the country. Betty Furness, on Westinghouse's Studio One, will invite the public to the "Freedom Fair" that Monday night. No time limit has been set on the length of the "Fair."

Pictures by Westinghouse Electric Corp

WESTINGHOUSE SALESMAN carries out film theme as he shows prospect "red hot in 30 seconds" feature of a Westinghouse range

A BALLET with choreography by Alex Romero brings "Ellis in Freedomland" to a close. Film is part of a $250,000 training program

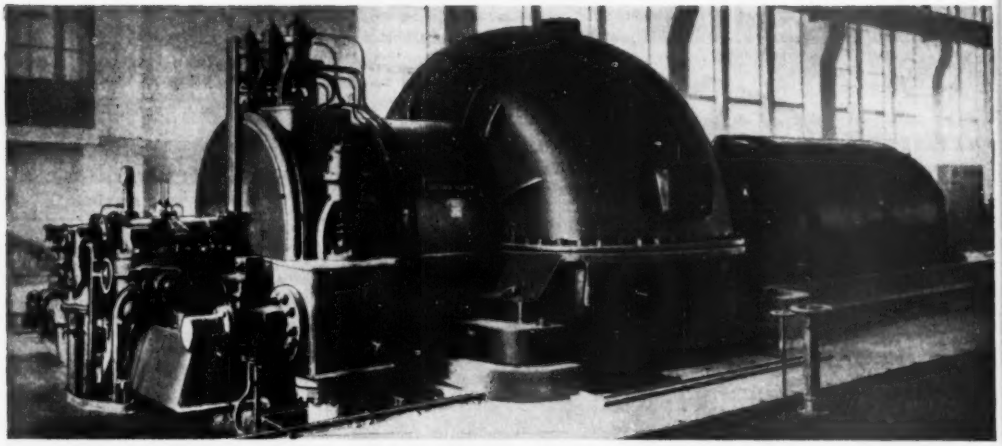
● TOP EFFICIENCY ● MINIMUM MAINTENANCE

● THOROUGH DEPENDABILITY ● LONG LIFE

● COMPACT DESIGN ● PROMPT DELIVERY

● BROWN BOVERI QUALITY

all this—
and lower cost, too



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BROWN BOVERI
TURBO GENERATORS

BROWN BOVERI

It will pay you to know more about Brown Boveri Turbo Generators.

Write for descriptive data.

BROWN BOVERI CORPORATION

19 Rector St., New York 6, N. Y.

JUMPER CLAMPS

ARMOR ROD CLAMPS

SPLIT BOLT CONNECTORS

WEDGE GRIP CONNECTORS

Sherman®

CONNECTORS

ARE RIGHT FROM EVERY VIEWPOINT

ENGINEERING

"Sherman Connectors are designed better . . . they're stronger, more dependable."

MANAGEMENT

"Sherman Connectors are not only highly satisfactory—they're priced right, too."

SUPERVISION

"My men work better and faster with Sherman Connectors."

WRITE FOR SHERMAN'S ELECTRIC CATALOG

H.B. Sherman MANUFACTURING CO. BATTLE CREEK, MICH.

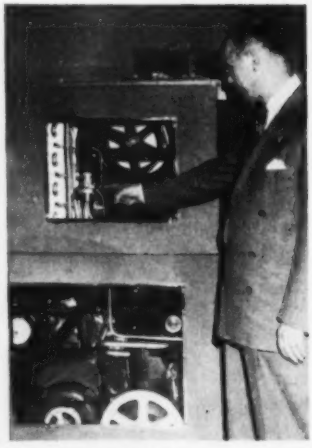
Electrical Fittings for Wire and Cable

Anaconda Issues New Three-in-One Catalog

Anaconda Wire & Cable Co's new catalog was released on April 1. The latest word in the cable reference-book field, it is the result of eight years of work. While primarily a catalog of Anaconda's products, its several hundred pages combine features of products other than those made by Anaconda. Engineering and application data likewise pertain to the entire cable field and not only to Anaconda products.

More than one-half of the book is devoted to engineering data and cable materials data, and when future sections are completed this figure will be upped to two-thirds. The engineering sections are designed for both the experienced engineer and the young engineer or non-technical person who deals in cable and wire. The section "How to Select Cable for a Job" is a good example.

Proof of the popularity and value of this text is that over 3,000 copies were requested from E. F. Luna, Anaconda Wire & Cable Co, 25 Broadway, New York 4, two weeks before the scheduled release date. Only 15,000 copies are planned.



GE Heat Pump

H. M. Brundage, manager of Heat Pump Department of Air Conditioning Division, General Electric Co, is shown in Dallas, Tex., inspecting a unit from one of the first carload shipments of heat pumps delivered by GE for commercial installation in the Southwest.

LOOK... FOR THE YELLOW TRIANGLE –

a symbol of Wickwire Quality when you're buying wire rope. It's your assurance of utmost stamina and uniformly dependable performance ..longer, more economical service on the job.

Write for free copy of "Know Your Ropes" —82 pages of helpful information on selection, application and correct usage of wire rope. Address your request to: Wire Rope Sales Office, Palmer, Mass.

The Colorado Fuel & Iron Corporation, Denver, Colorado
The California Wire Cloth Corporation, Oakland, California
Wickwire Spencer Steel Division, Palmer, Massachusetts

WICKWIRE ROPE CF&I

BRANCHES IN ALL KEY CITIES

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ENGINEERS, SCIENTISTS

Unusual opportunities for outstanding and experienced men.

These top positions involve preliminary and production design in advanced military aircraft and special weapons, including guided missiles.

IMMEDIATE POSITIONS INCLUDE:

Electronic project engineers
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Radar engineers
Flight test engineers
Stress engineers
Aero- and thermodynamicists
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Power-plant installation designers
Structural designers
Electro-mechanical designers
Electrical installation designers
Weight-control engineers

Excellent location in Southern California. Generous allowance for travel expenses.

Write today for complete information on these essential, long-term positions. Please include resume of your experience & training. Address inquiry to Director of Engineering.

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Hawthorne (Los Angeles County) Cal.

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing two vertical shaft, 9,400 horsepower, 150 rpm hydraulic turbines for Nimbus Power Plant, Central Valley Proj., Inv. No. DS-3697.

California—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, installing generators for Nimbus Power Plant, Central Valley Proj. on right bank of American River, approx. 6¾ mi. downstream from Folsom Dam and Power Plant and approx. 5 mi. from Folsom, Spec. DC 3696. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Loveland, Colo., completion of Pole Hill Power Plant and Switchyard and Flatiron Power and Pumping Plant and Switchyard, Estes Park-Foothills Power Aqueduct, Colorado-Big Thompson Proj. 14 mi. and 9 mi. respectively west of Loveland, Spec. DC 3691.

Iowa—Iowa Public Service Co., 502 6 St., Sioux City, Ia., construction 120 mi. of high voltage transmission line, Sioux City to Fort Dodge. $350,000.

Ia., Algona—Bd. Trustees Municipal Utilities, c/o Ira A. Kohl, secy., City Hall, municipal electric light and power plant imprvs. Plans deposit $15. Buell & Winter, Insurance Exchange Bldg., Des Moines, Ia., engrs.

Kans., Parsons—The Kansas Gas & Electric Co., c/o Murray Gill, pres., Parsons, plant expansion on Neosho River, $10,000,000.

Missouri—Southwestern Power Admin., Office of Administrator, Petroleum Bldg., Fifth and Boulder Sts., Tulsa, Okla., 14 mi. transmission lines. Plans deposit $15.

Montana—Bureau Reclamation, Dpt. Interior, Billings, 3 current and 3 potential transformers, 3 watthour recording demand meters for Wolf Point substation, Fort Peck Proj. Spec. 600S-89. L. N. McClellan, Bldg. 1A, Denver, Colo., ch. engr.

Nebraska—Bureau Reclamation, Dpt. Interior, P. O. Box 280, Casper, Wyo., furnishing, del. switching equip. and unit sub-station for Bridgeport sub-station, Transmision Div., Missouri River Basin Proj., Inv. No. 7658-235.

North Dakota—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Bismarck, one lot very-high-frequency radio equip. for Kildeer radio relay station; Cahoon radio relay station, Bismarck terminal station, Bismarck Central Station No. 1; Bismarck Central Station No. 2; Dawson radio relay station; Jamestown terminal station, Carrington radio relay station, Devils Lake radio relay station, Devils Lake Central Station No. 1, Devils Lake Central Station No. 2, Rugby radio relay station; 20 mobile very-high-frequency radio transmitter-receiver combinations and 6,000 lin. ft. type RG-17/U coaxial cable for Missouri-Souris Dist. Missouri River Basin Proj., Inv. No. DS-3695.

Va., Norfolk—Virginia Electric & Power Co., Boush & Bute Sts., electric transformer in Oakwood Terrace Sect. $400,000.

Va., Yorktown—Pub. Wks. Office, Headquarters, Fifth Naval Dist., U. S. Naval Base, Norfolk, Zone 11, installing emergency power plant and renewal electrical distr. switchboard at U. S. Naval Schools (Mine Warfare) NOY 71279, Spec. 32849. Plans deposit $10.

Wisconsin—Polk-Burnett Electric Cooperative, Centuria, Wis. 183 mi. rural distr. line and sys. imprvs., Polk and Burnett Counties, $265,000.

Wyoming—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center,

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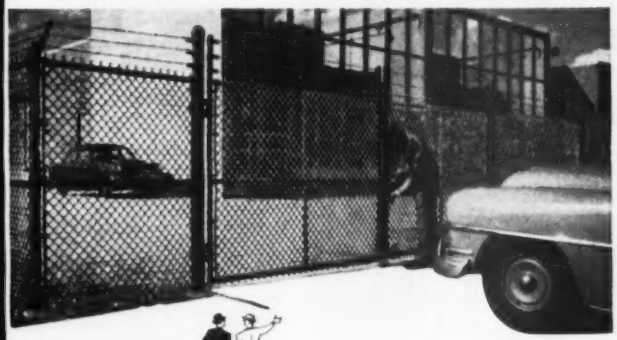

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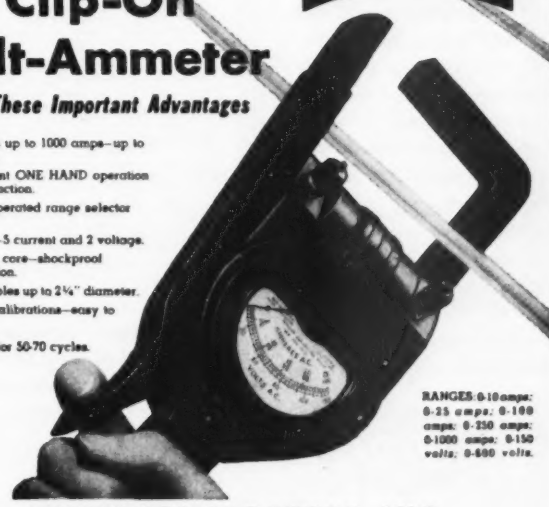

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Other GREENLEE timesaving tools for electrical work: Hand Benders; Joint Borers; Cable Pullers; Knockout Tools; Auger Bits and Drills.

Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Casper, Wyo., and Loveland, Colo., control board, receiver-watt recorder for Alcova Power Plant, Kendrick Proj., Spec. DS 3699. L. N. McClellan, ch. engr.

Alaska—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Eklutna Siding on Alaska Railroad, one indoor, metal-clad switchgear assembly, for Eklutna Power Plant, Eklutna Proj. Inv. No. DS-3694.

British Columbia — British Columbia Comm., Victoria, B. C., 60-kilovolt electrical transmission line from Nanaimo to Parksville, $200,000.

Low Bidders & Contracts Awarded

Ga., Jasper—Carroll E. Daniel Constr. Co., Gainesville, Ga., CA $82,000, warehouse and office, Amicalola-Electric Membership Corp., Jasper, Ga. Bids Mar. 18.

Mo., St. Louis—Wm. H. and Nelson Cuniff Co., 3320 Lindell Blvd., St. Louis 3, Mo., CA $200,000, 1 story, 89x242 ft., rein.-con., brick electric mfg. plant, 4450 Semple Ave. Moloney Electric Co., 5390 Bircher Blvd., St. Louis 20, Mo. Fred S. McNeill, 3320 Lindell Blvd., St. Louis 3, Mo., archt.

Montana—General Electric Co., 650 17 St., Denver, Colo., CA $69,117, Schedule 5, 3 metal-clad switchgear assemblies for Canyon Ferry power plant, Missouri River Basin Proj. Spec. DS 3616. Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo. Bids Feb. 14. Awarded Mar. 11.

Pa., Morganza—Hiles & Lightholder, 133 N. Jefferson Ave., Canonsburg, Pa., CA $100,000, corrections to electrical distr. sys. at Pennsylvania Training School Dpt. Property & Supplies, 319 N. Front St., Harrisburg, Pa., W. B. Jeffries, c/o owner, ch. engr. Awarded Mar. 17.

South Dakota—Wagner Electric Corp., 6400 Plymouth St., St. Louis, Mo., LB $108,642, Schedule 1, three 8,333-kva transformers.

South Dakota—General Electric Co., River Rd., Schenectady, N. Y., LB $61,422, Schedule 2, one 69,000-volt voltage-regulating transformers, Spec. DS-3645, Missouri River Basin Proj. Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo. Bids Mar. 11.

South Dakota—Wagner Electric Corp., 6400 Plymouth St., St. Louis, Mo., LB $108,642, Schedule 1, three 8,333-kva transformers.

South Dakota—General Electric Co., River Rd., Schenectady, N. Y., LB $61,422, Schedule 2, one 69,000-volt voltage-regulating transformer, Missouri River Basin Proj. Spec. DS-3641. Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo. Bids Mar. 11.

Texas—Gonzales County Telephone Cooperative, Gonzales, Tex., Purchase and hire, $170,000, approx. 100 mi. rural pole telephone lines, Gonzales Co.

Washington—Columbia River Constructors, c/o Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Idaho, LB, $39,749,997, est. $42,775,610, powerhouse, intake structure and appurtenances, for Chief Joseph Dam, Bridgeport, CIVENG 45-108-52-28, U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash. Bids Mar. 19.

Que., Ste. Marie De Beauce—Metropole Electric Inc., 4540 Garnier St., Montreal, Que., CA, $140,230, power distr., duct system and street lighting. Govt. of Canada, Dpt. National Defence Air, Cartier Sq., Montreal, Que., Defence Constr. (1951) Ltd., 70 Lyon St., Ottawa, Ont., engr.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Calif., Richmond—Richmond Union High School Dist., 1108 Bissell Ave., Richmond, voted $7,000,000 bonds, high school and 2 junior high schools and voted $5,000,000 bonds, schools and alterations.

D. C., Wash.—Sears & Roebuck Co., 4500 Wisconsin Ave. N.W., store at Alabama Ave. and Naylor Rd. S.E., $2,700,000.

La., New Orleans—Alton Ochsner Medical Foundation, 607 Gravier St., hospital, $5,000,000. Plans deposit $150, Ellerbe & Co., E. 505 First National Bank, St. Paul, Minn., archts.

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BOOK REVIEWS

Measurements

Electrical Measurements. By F. K. Harris. Published by John Wiley & Sons, Inc, New York 16. 784 pages, illustrated. Price $8.

Workers in laboratories where electrical measurements are made will find this text fully as pertinent as the student in a technical school. This comes naturally from the author's dual experience as a professor and a physicist at the National Bureau of Standards. Appreciation presupposes a knowledge of physics, calculus and basic electrical engineering. The user can delve to whatever degree of measurement refinement he desires and he should not expect to find a magic prescription for painless and automatic success in measurement. Scope is confined to d. c. and low frequency a. c. and the subject matter embraces a lucid explanation of units before taking up galvanometers, indicating instruments, resistance, magnetics, electro-thermic and electronic instruments. Succeeding chapters take up power and energy, watthour meters, instrument transformers, oscillographs and bridges.

Transients

Transient Electric Circuits. By Hugh Hildrith Skilling. Published by McGraw-Hill Book Co, 361 pages, illustrated. Price $6.00.

With emphasis on basic principles, this text treats the general methods of the solution of transient problems with many specific examples for the purpose of preparing the student to attack with confidence any sort of transient problem that may arise.

This second edition presents the Laplace transformation method of solution of transient problems in addition to the more familiar treatment that has come to be called the "classic" method.

All necessary mathematics beyond ordinary calculus is carefully explained.

In general, questions are related to practical engineering. Many have been taken from current periodical literature.

Farm Electric Service

The Story of Electric Service for the Farmer. By P. R. Rutledge. Published by Delmar Publishers, Inc. Albany, N. Y. 68 pages, illustrated. Price $1.00.

This volume is designed to provide people to whom farmers look for information with a simple and understandable explanation of electric power as it applies to agriculture. Part 1 outlines the power company organization and how it carries on its business. Part 2 explains how electrical energy is derived from various fuels, and transmitted and distributed. Part 3 presents the service available for the farm and home operations. An appendix lists equipment for use on the farm, also an estimated annual kilowatt-hour consumption to determine the cost of operating the electrical aids.

Ether and Electricity

History of the Theories of Ether and Electricity. By Sir Edmund Whittaker. Published by Philosophical Library, New York 16, N. Y. 434 pages, illustrated. Price $12.00.

Electrical engineers have a legitimate if at times only a vicarious interest in the prevailing theories of the atom, the ether, and the electron. That is because electricity is largely electrons multiplied. That interest can be nourished if established, or tittilated if merely incipient, by this Cambridge professor's review of the stages by which present hypotheses have evolved over the years from the surmisings of the ancient Greeks to the latest modern enunciations. Intrusion of mathematics is casual and the text is

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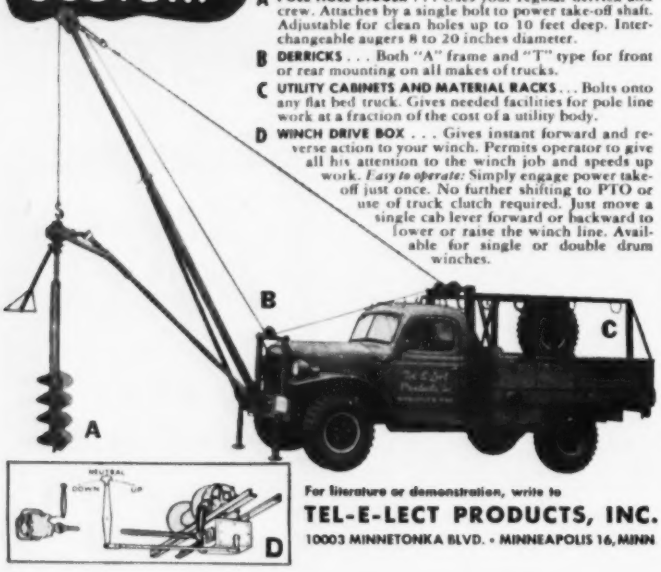

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Electric Potentials

Electrical Phenomena at Interfaces. **By J. A. V. Butler. Published by the Macmillan Co, New York 11, N. Y. 389 pages, illustrated. Price $6.75.**

Those engaged in electrolysis, electroplating, corrosion prevention, and resuscitation will find subject matter of interest here, provided they are willing to delve into the physics, mathematics, and philosophizing in which the book is couched. In support of this conclusion may be mentioned the following subjects; electric double layer, electro-osmosis, cataphoresis, electro-kinetics generally, ionic crystals, colloid stability, concentration polarization, H and O polarization effects at electrodes, and electric properties of human cells and tissue. Treatment of them absorbs at least three-fourths of the book's pages.

AC Power Control

Saturating Core Devices. **Leonard R. Crow. Published by The Scientific Book Publishing Co, Vincennes, Indiana. 373 pages, illustrated.**

Of the many facets embraced by the general subject of electricity, one of the most interesting to the beginning student can be the saturating core devices. In following this approach, the author has avoided use of involved and cumbersome proofs; instead he hopes to keep the reader's interest alive through the use of descriptive and graphical methods.

A collection of saturating core devices, with simplified description and applications, includes the permanent magnet controlled type; the ac controlled saturable-core reactor; peaking transformers; frequency multiplier devices; and magnetic amplifiers. A good portion of the book is devoted to the subject of electronics and the saturable-core reactor.

For the design and practicing engineer, the author has included a basic bibliography on saturating core devices and related subjects.

Instruments

The Watchmaker's Lathe. **By Donald deCarle. Published by N.A.G. Press, Ltd, London, W. C. 154 pages, illustrated. Price 30s. ($7.50).**

Instrument repair and construction can hardly be done on a lathe much larger than a watchmaker's. This tells the details, workings, use, and good care of 5 USA makes and 22 from other countries. In fact an indifferent mechanic ought be able to do a respectable job following the instructions well expressed and illustrated here.

Electronics

Alternating Current Fundamentals. **By Joseph J. DeFrance. Published by Prentice-Hall, Inc, New York. 189 pages, illustrated. Price $4.65.**

This volume is the second in a series of text books designed for the beginning student who wishes to proceed later into the fundamentals of electronics. After a short chapter which introduces the student to the principles of electronics, the book launches into the several rudiments of alternating current as they apply to electronics.

The text is simple and concise. Questions and problems at the end of each chapter provide a good review of the preceding material. Thoughtfully included is a chapter dealing with vector algebra for ac circuits.

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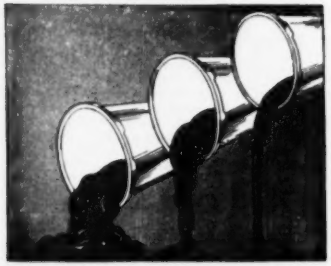

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● FIRE PROTECTION: This new 32-page booklet gives detailed information on how to use an extinguisher and what type of extinguisher is suited for a particular class of fire. Booklet illustrates and describes the various sizes of units available. Write American-LaFrance-Foamite Corp, Elmira, N. Y.

● CABLES: Ansonia Electrical Co has released two catalogs on cables, one covering railroad communication cables and the other traffic cables. Aerial, duct and direct-burial cables are discussed. Booklets give application data, physical data and electrical data for these cables. The Ansonia Electrical Co, Ansonia, Conn.

● REGULATING VALVES: Bulletin 700 features a large cutaway illustration of a typical Spence pilot-operated regulating valve with detailed explanations of fine design features. A panel is devoted to showing how the control function of a regulator can be changed by a different sensitive pilot. Spence Engineering Co, Inc, Walden, N. Y.

● INSULATING MATERIALS: Various types of electric insulating materials produced by the Chemical Division of GE are described in bulletin CDL-35. Properties and applications of varnishes, sealing and filling compounds, silicone insulating materials, varnished cloths and tapes are described. Write General Electric Co, Chemical Division, Pittsfield, Mass.

● LOAD BREAK OIL SWITCHES: G&W Bulletin DC51 describes the PK load-break oil-switch. These 5000-v single-throw switches are rated 200, 400 and 600-amp and are widely used for load-break cable circuit disconnection. Switches with air breaks are also listed in the bulletin, as are type OPK switches for hazardous locations. G&W Electric Specialty Co, 7780 Dante Ave, Chicago 19, Ill.

● CABLE AND CONNECTOR CHART: A cable and connector chart has been prepared recently. The chart shows simply and easily the correct fitting to use for five different types of wire and cable. Write to the Thomas and Betts Co, Inc, 14 Butler St, Elizabeth, N. J.

● LIGHTNING ARRESTERS: Valve-type lightning arresters are described in a new bulletin issued by Ohio Brass. Application and impulse protective characteristics for these arresters as well as general catalog data is included. Write to the Ohio Brass Co, Mansfield, Ohio.

● MOTOR TESTER: A new bulletin describes the PMO8 motor tester, developed by Elektrotechn Laboratorium, which is used to localize trouble in electrical machines. The tester can be used to locate shorts between turns, interruptions and other faults. Catalog includes technical data on the tester. Write Columbia Technical Corp, 5 East 47 St, New York 22, N. Y.

● ROTARY FEED TABLES: Bulletin T-85 illustrates and describes completely the bellows rotary work feed table. The 16-page bulletin describes in detail the tables for feeding work pieces to machine tools. Wiring diagrams and electrical hook-ups are included. The Bellows Co, 222 W Market St, Akron, Ohio.

● DUST RECORDER: A new power plant gas dust analyzer with a Brown Electronik potentiometer is described in data sheet No 10.14-6. A description of the analyzer, and its operation is told in detail. Minneapolis-Honeywell Regulator Co, Station 40, Philadelphia 44, Pa.

● INDUSTRIAL LAMINATES: The numerous grades of GE industrial laminates are fully described in a new catalog, CDL-38. Mechanical, chemical, physical, thermal, and electrical properties plus tolerances are listed. Write Chemical Div, General Electric Co, Pittsfield, Mass.

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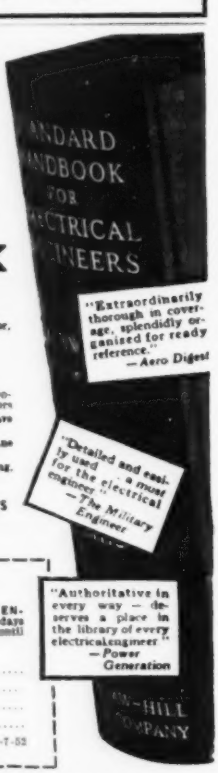
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Iron Nickel Alloys—A 32-page bulletin with over 20 tables and charts describes austenitic iron-nickel alloys having low or controlled thermal expansion or thermoelastic characteristics. Trade names, typical compositions, sources and distinctive properties are summarized. This bulletin is available from International Nickel, Dept EZ, New York 5, N. Y.

Nickel Alloy Steel Castings—This 32-page bulletin contains over 100 illustrations and reports on steel, cast to shape, as a reliable engineering material. Data on properties and applications of cast nickel steels of the constructional grades are classified by industrial fields. Low temperature properties, abrasion resistance, depth hardening and welding are discussed. Advantages and recommended specifications and compositions for typical service applications are given. International Nickel, Dept EZ, New York 5, N. Y.

Constants of Pure Liquids—A *Table of Dielectric Constants of Pure Liquids*, NBS Circular 514, has been published recently by the National Bureau of Standards. Prepared by A. A. Maryott and E. R. Smith, this table contains sections on standard liquids, inorganic liquids, organic liquids and a complete list of references. In this table, only the low frequency or static values were considered. Available from Gov't Printing Office, Washington 25, D. C.

AC Network Operations—This is a report of the Transmission and Distribution Committee of EEI. Seventy-two companies submitted data on the operation of 309 networks in 151 localities, which were compiled and tabulated for the period 1947 to 1949, inclusive. This is a more simplified, condensed, and rearranged report than previously prepared. Publication 51-6 available at slight charge from Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Index to NEMA Standards—A descriptive index to *NEMA Standards Publications* has been published to aid the users of NEMA standards in choosing those which would best meet their individual needs. Copies available on request. National Electrical Manufacturers Assoc, 155 E 44 St, New York 17, N. Y.

Smoke Prevention—A new publication, *Application of Overfire Jets to Prevent Smoke from Stationary Plants*, has been prepared by Bituminous Coal Research. This report has become an industry standard for the design, construction and application of overfire jets to abate smoke from stationary plants. Bituminous Coal Research, Inc, 2609 First National Bank Bldg, Pittsburgh 22, Pa.

Pole Top Pins—*Specifications for Pole Top Pins* has been approved recently by the Transmission and Distribution Committee of EEI. These specifications are issued as engineering information and in the expectation that they may be useful in promoting uniform practices. Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Guy Hooks and Strain Plates—*Specifications for Guy Hooks and Guy Strain Plates* has been recently approved and published by the Transmission and Distribution Committee of EEI. Write to Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

Oil and Gas Engine Power Costs—A new booklet has been released recently by the ASME. Called *Report on Oil and Gas Engine Costs for 1950*, the report covers 146 plants and is a report of facts only. Available at $2.50 a copy from American Society of Mechanical Engineers, 29 W 39 St, New York 18, N. Y.

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UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, Sealed bids (Specifications No. DC-3696) will be received by the Bureau of Reclamation, Denver, Colorado, until April 24, 1952, and then publicly opened for furnishing and installing two 7,500-kva, 90-percent power factor, 150-rpm, 4,160-volt, 3-phase, 60-cycle, alternating-current, vertical-shaft, open-type, air-cooled generators for Nimbus Power Plant, Central Valley Project, California. Completion of installation is desired within 900 to 960 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

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4	2500	West.	44000—11000
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
3	100	West.	33000—240/480 NEW
3	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000Y
3	50	Kuhl.	33000—7200/12470 Y
1	450	A. C.	25410/44000—13280/23000
6	100	G. E.	22000—7200/12470 Y
9	50	G. E.	22000—2300
3	37½	G. E.	22000—6900
6	200	G. E.	13200—2300
4	333	Wag.	7200/12450 Y—2300
1	100	West.	7200/12470 Y—2400
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3	333	Pitts.	6900/11900—550
3	150	Wag.	6900—2300
3	200	G. E.	6600/11430—575
3	37½	G. E.	6900—230/460
2	150	West.	4800/8315 Y—480
3	333	G. E.	2300—230/460
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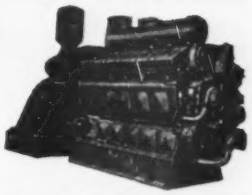

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1875	Fairbanks Morse	38F16	2600	300	375	Enterprise	DSG-6	440	450
1420	Fairbanks Morse	38D8¼	1800	720	330	Superior	KNA	390	514
1250	General Motors	16-278A	1600	720	312	General Motors	3-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand	S	225	514
425	Baldwin	VO-6	510	450	187	General Motors	3-268A	180	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	—6000	Al. Ch.	Condensing 200/250 I.S.P. 2300 v 3/60 Exc. & Surf ce Cond. «
1	—750	G.E.	Condensing — 425 lbs. 750 TT I.S.P. 440 v. 3 ph. 60 cy.— Built 1944
1	—500	Moore	Non-condensing 150/200 lbs I.S.P. 5/35 lbs. G.B.P. 3. 60/480 volts Direct Connected Exciter
1	—400	Westg.	Non-condensing — 135/180 lbs. I.S.P. 5/10 lbs. B.P. — 240/480 v. 3 ph. 60 cy.
1	—300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.—480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2	—2000	G.E.	300	600 2k cy.	11000
1	—1500	G.E.	720	600	13200
1	—1500	G.E.	360	275	2300/4400
1	—1000	G.E.	900	200	4100/6900
1	—1000	G.E.	600	600	2300/4150
2	—1000	Whse.	900	600	2300/4150
1	—500	Whse.	900	250	6900/13200
1	—500	Whse.	1200	125/250	2300
1	—500	Whse.	900	250	440
1	—500	G.E.	720	125	2300
1	—400	G.E.	720	250	440/2300
1	—300	G.E.	900	125	4150
1	—150	G.E.	1200	275	2300
1	—150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
3—1065	G.E.	OISC	3	22860/12200x2300
1—1250	Whse.	OISC	2	13200x525
3—1250	G.E.	HVDDJ	1	9600x550
3—1000	Pitts	OISC	1	23000x13200 2200
3—1000	G.E.	HVDDJ	1	2300x480
3—500	A.C.	OISC	1	13200/2300

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

—TRANSFORMERS—

BOUGHT AND SOLD

We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes.
One Year Guarantee.

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"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 Silver St. NORTH BERGEN, N. J. N.Y.C. Pal. Ridge Line P.R.R. Weehawken Ferry

TRANSFORMERS

1—1500 KVA Whse., 3 Ph., 33,000/66,000-240/480V, HT taps.
1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
1—200 KVA G.E., 3 Ph., 2400-220 Sec.
3—100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
2—100 KVA Newark, 440V 3 Ph., 220V 2 Ph.
6—50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.
2—25 KVA G.E., 1 Ph., 11,560V pri., 230/460V sec.
3—25 KVA G.E., 1 ph. 560V. pri., 110/220 sec.

SYNCHRONOUS MOTORS

1—300 H.P., Elec. Mach. 720 RPM. 3 Phase 60 cyc., 2200V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1—200—KW Whse., 275V. 900 R.P.M., 220 V Syn.
1—176 KVA West., 1 Ph., 228V, Motor 3 Ph., 480V.
1—150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1—100 KW G.E. 250V. 900 RPM, 2300V. Syn.
1—75 KW Cr Wh. 230V, 1200 RPM, 2300/3150V Syn.

SLIP RING MOTORS

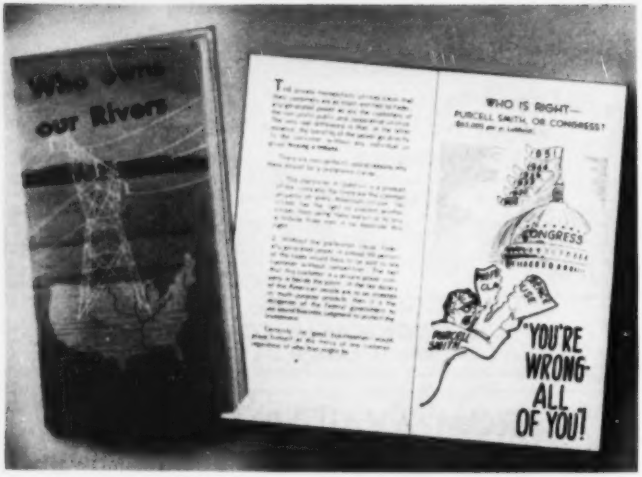
1—2500 HP G.E., MT. 257 RPM 6600V.
1—250 HP West., CW. 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with DC EXC.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR



Who Owns Our Rivers

To the Editor:

On page 62 of your February 25, 1952 issue, there is an article under the headline "TVPPA is Off the Track".

The article refers to a pamphlet "Who Owns Our Rivers." Will you please tell me where I can obtain a copy of this pamphlet?

C. K. Stover
New York State Electric & Gas Corp
Binghamton, N. Y.

• The pamphlet was prepared by the Tennessee Valley Public Power Assn's Information Committee, Electric Power Board Bldg, Sixth & Cherry Sts, Chattanooga 6, Tenn.

United We Stand

To the Editor:

The proposed expansion of the Engineers Joint Council is an excellent move to unify the engineering profession and consequently give a much needed boost to the social recognition of its members.

Due to many contributing factors, being an engineer in the United States has been somewhat of a dubious honor, much unlike other countries. In Europe and South America, for instance, the engineering profession is more nearly parallel that of law or medicine. In South America the engineer signs his name with "Ing."

Social recognition does not necessarily mean monetary payments or wages. The ever present quibbling about minimum fees and salaries by some groups does very little to improve our station. We can never expect to obtain a universal yardstick for engineering charges, anymore than we can compute a coefficient which when applied to any problem will give the answer.

Do we need a good publicity agency, which in simple terms can explain the non-technical details of how the engineer's work affects the lives of Mr. John Q. Public? Much of this is being done, but much more is needed. The public is always interested in knowing WHY.

What is lacking? What can we do to improve our lot? These are questions which every engineer, in every field of endeavor, should ask himself and his associates.

Unification is one phase of the answer. For with the combined efforts of the 225,000 members of the various engineering societies, we can present an organization second to none. Taking our slogan from the greatest democratic unity in the world, let our motto be "United We Stand".

Thank you for your interest on a subject so important to the engineers in this country. We rely on your publication to keep us informed.

Louis A. Warner,
Engineer

East Haven,
Connecticut

Exceeds Quota

To the Editor:

The editorial on our "Production For Freedom" program on page 70 of the Feb. 11 issue of Electrical World interested us very much.

We are happy to report that the campaign is meeting with a fine response and the first three months were particularly gratifying with all of the divisions exceeding their quotas by substantial margins.

F. C. Hersh
Pennsylvania Power & Light Co
Allentown, Pa.

Members Should Act

To the Editor:

You are to be congratulated on your editorial "Democracy In AIEE" in the March 10, 1952 Electrical World. You certainly covered the subject well and diplomatically.

One reason for this condition is the fact that the dues of a rather large percent of the AIEE membership are paid by the employers of Institute members. There have been numerous rumors that several large corporations have threatened to discontinue this practice if the Institute did not act in accordance with their wishes. This is certainly an unhealthy condition, and publicity in an editorial would be well worthwhile.

If some of the members took advantage of Paragraph 31, Article VI, of the constitution of the AIEE, the evils mentioned in your editorial could be eliminated.

John C. Parker
Supervisor

Insulation Test Dept
Memphis Light, Gas
& Water Division
Memphis 1, Tenn.

Equation in Error

To the Editor:

It has just been brought to my attention that there is a typographical error in our story on relaying of 6-wire transmission which was published in the December 31 issue. On page 69 the value of K_s is shown:

$$K_s = 1 + (Z_a + Z_b) - 2/Z$$

This should have been:

$$K_s = 1 + (Z_a + Z_b)\, 2/Z$$

H. P. Dupuis
Commonwealth Associates, Inc
Jackson, Michigan

SINCE 1933, utilities all over the country have brought the advantages of low-cost, accurate ⅝% step voltage regulation to distribution feeders with Allis-Chalmers ⅝% step regulators. Nineteen years of experience have proved that the accuracy, reliability, and low maintenance requirements of Allis-Chalmers regulators increase profits.

Cut Costs, Raise Revenue

ACCURATE, LOW COST VOLTAGE REGULATION INCREASES PROFITS

YOU CAN INCREASE REVENUE with Allis-Chalmers ⅝% step JFR distribution regulators. With accurate voltage regulation you get more revenue per customer. And customers are happier because their appliances operate better.

You can extend lines or add load at minimum cost too. Voltage will not drop when more customers are added to the line because the 20% range provided on Allis-Chalmers JFR distribution regulators gives plenty of room for expansion.

Best of all, this accurate, reliable voltage regulation comes at low cost. The low price tag on Allis-Chalmers distribution regulators plus low installation and maintenance costs means that these regulators pay their own way in increased revenues in a short time.

Check all the features of the Allis-Chalmers JFR distribution regulator: ± 1 volt band, 20% range, long life contacts, trouble-free tap changing mechanism, unit construction, and jump-proof mounting brackets. Call your nearest Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

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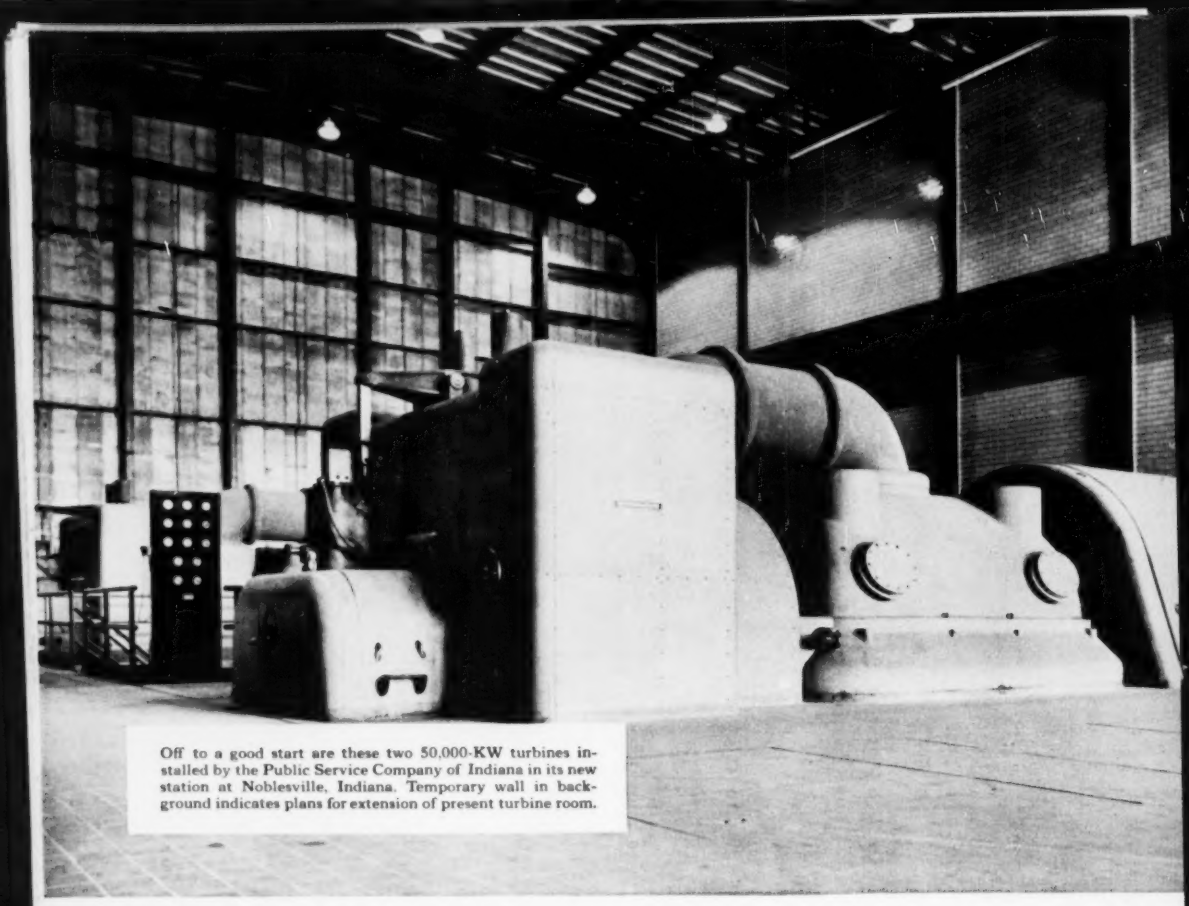
RATINGS AVAILABLE

7620 VOLTS — 15-50-100 AMPS
5000 VOLTS — 50-100 AMPS
2500 VOLTS — 100-200 AMPS

ALLIS-CHALMERS

Originators of ⅝% Step Regulation



Off to a good start are these two 50,000-KW turbines installed by the Public Service Company of Indiana in its new station at Noblesville, Indiana. Temporary wall in background indicates plans for extension of present turbine room.

New turbines with the future guaranteed

● When these two 50,000-KW turbines were placed in service recently for the new Public Service Company of Indiana generating station at Noblesville, Indiana, NONPAREIL Turbine Oil was used for the initial fill . . . assuring trouble-free lubrication for the life of the turbines themselves.

With this installation, as with every installation of NONPAREIL Turbine Oil, plant operators received a written guarantee that the oil will last as long as the turbines and will never exceed a neutralization number of 0.15 mg. KOH/gm. Lasting, low-acidity assures that NONPAREIL will not have to be removed for treatment or for cleaning the lubrication system.

For guaranteed lubrication in your own turbines . . . new or old . . . fill with NONPAREIL. A Standard Oil lubrication specialist can show you the facts, including service records covering up to twenty-three years continuous operation of NONPAREIL Turbine Oil. Contact your local Standard Oil Company office. Or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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